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(Alm.) 1845 e. $\frac{16}{1815}$

EVENING AMUSEMENTS;

OR,

THE BEAUTY OF THE HEAVENS *DISPLAYED.*

IN WHICH
SEVERAL STRIKING APPEARANCES,
TO BE OBSERVED ON VARIOUS EVENINGS IN THE
HEAVENS
DURING THE YEAR
1815,
ARE DESCRIBED.

TO BE CONTINUED ANNUALLY.

By WILLIAM FREND, ESQ. M.A.

ACTUARY TO THE ROCK LIFE ASSURANCE COMPANY, AND LATE FELLOW
OF JESUS COLLEGE, CAMBRIDGE; AUTHOR OF PRINCIPLES
OF ALGEBRA, TANGIBLE ARITHMETIC, ESSAY
ON PATRIOTISM, ETC.

DOCENDO DISCO.

LONDON:
PRINTED FOR J. MAWMAN, Nº 39, LUDGATE STREET.
1815.
[Price 3s. boards.]

J. A.

BIBLIOTHECA BODLEIANA
DOMINUS ILLUMINATIO MEA

C. WOOD, Printer,
Poppin's Court, Fleet Street.

ADVERTISEMENT.

In this year's volume the plan of former years is continued, but the paths of the moon and planets are marked with greater accuracy; and I hope that instructers will not think amiss the recommendation to them in page 165. The tracing of the path of the planet Ceres carried my attention more particularly to the four newly discovered planets, and has given rise to various observations, which will be new to most of my readers, and will afford matter of contemplation to the profoundest astronomer. The table, in page 185, will be particularly acceptable to many persons in possession of good telescopes; and to such I request it may be communicated by those into whose hands this volume may fall, as the information in it may not otherwise come within their notice. The table of the motion of Mercury, page 188, will be found very useful to persons, who may happen to be in the Indian Ocean, China, or the Pacifick, at the time of the approaching transit of Mercury over the Sun's disc.

EVENING AMUSEMENTS;

OR, THE

BEAUTY OF THE HEAVENS

DISPLAYED.

TO THE READER.

I HAVE found it of use, after having studied a subject with considerable attention, that my thoughts should, either from accident or design, have been diverted from dwelling upon it. Thus after an interval has elapsed, in which the mind may be said to have laid as it were dormant, it comes with renewed vigour to the examination of a question; and seeing it in a different point of view, and with a degree of impartiality, its judgements are more likely to be correct. In this manner my opinions on the science of number have been formed, which, of course, I learned first according to the common routine;

and in due time was introduced at college into the mysteries of algebra. These I embraced, as others do, in the same manner as sir Isaac Newton had done before us: but other studies engrossed, for a time, my whole attention; and when I returned to my algebra, its mysteries proved to be complete nonsense, and the science, freed from them, appeared more easily attainable, and more worthy of attention.

Sir Isaac Newton did not introduce, he was only the patron of these mysteries. The famous proposition, sanctioned by his authority, that quantities are of two kinds, some greater others less than nothing, had been accredited before he wrote his book on universal arithmetick. It may cause surprise, that such an opinion could ever have been started, or, having been started, that it should have found reception in minds so enlightened as those of Newton and Euler; and particularly that mathematicians, who pride themselves on the accuracy of their science, and the certainty of their demonstrations, should build up a fabrick on so palpably weak a foundation. The moment, however, the mind, freed from its former prejudices, views the proposition, and examines its terms, its absurdity is apparent, and all that is built upon it falls to the ground.

We are all of us liable to errour, and the lesson to be derived from the failures of great men is not a contempt for our superiors in talents, but a proper caution, that we should not place an undue degree of confidence in the opinions of others. We are not to be deceived by the grandeur of a name; and however admirable the powers of Newton's mind, yet, when he talks of quantities being less than nothing, and reasons upon such quantities, we are not to lay aside common sense, or to adopt so ridiculous an opinion, because it is sanctioned by high authority. This attachment to names is seen in a variety of instances, and men delight to form themselves into parties, under some celebrated leader, taking his opinions for granted, and grieving if they are denied or ever called in question. Thus there were two eminent men in Europe; one in France, the other in Holland; monsieur de Chauvin, and mynheer Van Herman. These gentlemen, according to the fashion of their day, Latinised their names, the one calling himself Calvinus, the other Arminius. Parties arranged themselves under these names, and the terms Calvinist and Arminian are now familiar to our ears; no small number of Englishmen submitting their judgement to the deceased Frenchman or Dutchman.

In the same manner, the terms Newtonians and anti-Newtonians have been coined: and a gentleman of the latter description, on the supposition, that I might be ranged in his party, did me the honour of inviting me to a lecture, in which the Newtonian system was to be completely demolished. I have no objection to the demolition of any system, if it is proved to be erroneous: but here was a misnomer; for, by Newtonian system, this gentleman meant a much older one, the Copernican, which, though adopted by Newton, is not to change its name. The system, indeed, is much older than Copernicus; but, from his introduction of it to men just emerging from the darkness of the dark ages, the honour was justly paid to his memory, of calling the system, by which the Sun is made the center, by his name. By using the term anti-Newtonian instead of anti-Copernican, opinions may be strangely confounded. I do not agree, I confess, with sir Isaac Newton in several opinions, that he has advanced, in algebra, philosophy, and chronology; but I certainly do wish, that my sentiments should not be misconceived, and that it should not be supposed, that I am desirous of lowering the character of this very eminent philosopher.

You will forgive my dwelling a little longer upon this topick, as it has been forced upon me by the remark, that I have heard on my two last volumes. The state of the question is this. The merit of the present system of astronomy is due to Copernicus, as from him chiefly is derived the knowledge of it in Europe. To Kepler we are indebted for the discovery of the elliptical orbits, and the relation between the distances and the periodical times of the planets. Sir Isaac Newton introduced the terms force and attraction, which have since been generally adopted. In fact, they are not necessary; for he is only measuring the deviations of a planet from the tangent of its orbit; and to this measure I have not the least objection whatsoever. The only question between us is on the cause of this deviation, which he attributes to the Sun's attracting or pulling the planet towards it; whereas I deny that there is any such power in the Sun, and I have looked out for another cause for this deviation. Whether I am right in my conjecture is another point; nor am I at all tenacious of my opinion, and it does not in the least impair the admiration I entertain for the mathematical talents displayed by sir Isaac Newton in his Principia.

I must make one farther remark, that arises out of this subject; namely, that persons who, as I have done, shall carry their minds from investigations on paper to the contemplation of the vast bodies in motion on all sides around us, cannot fail of being led to the acknowledgement, that these mighty works require the immediate hand and continued support of the great Creater. He is all in all, whether in the natural or the moral world. The more we consider every effect, the more are we led to the absolute dependence of all animate or inanimate beings on the Omnipotent. He it is, who directs the planets in their pathless motions. Through him is the regularity of the revolutions, by which his times and seasons are observed. I will not say that the Newtonian system of attraction leads to atheism, but it certainly has the tendency of setting aside the Creater from his works. When the particles have been endued with the attractive power attributed to them, and the orbs have been launched forth in empty space, then may all things go on as from the beginning. The sustaining hand of Omnipotence is no longer necessary. But I cannot for a moment separate matter from the all pervading influence of the Supreme: and wonder and astonishment are justly excited at that power, which first called matter into being, and gave and continues to give to it those motions, which are necessary for the preservation of his system. How all this is performed will for ages upon ages exercise the talents of the greatest philosophers; for God's thoughts are not like our thoughts, and his ways are past finding out: and as not a sparrow falls to the ground without his notice, so not a particle of matter can be moved independent of his perpetual superintendence.

Leaving then for a time all farther thoughts either on attraction or my own way of accounting for the motion of the heavenly bodies, I shall proceed, according to my usual method, to give an account of the appearances in the heavens in the month of

JANUARY, 1815.

THE Moon is on the 1st at midnight five degrees thirteen minutes north of the ecliptick, being then in the fourth degree of the seventh sign; and she rises, therefore, with the five stars in triangle of the Virgin between the seventh and third, but above the latter. Her distance from the ecliptick is slowly increasing, being greatest on the 2d, but only more than on the preceding day by about four minutes. On the 1st, she rises before midnight; and under her we see Jupiter, whom she passes during the morning of the 2d; and she rises in the morning of the 3d, and following days, directing her course through the space between the two first stars of the Balance to Mars, considerably to the east of her, and she arrives at her descending node early in the morning of the 10th. Her recess from Jupiter and progress by Mars are the chief features of her course. The latter planet she passes in the afternoon of the 6th. Her passage by the Sun produces an eclipse of this luminous orb, which is not visible in this country; but the Sun is centrally eclipsed on the meridian at forty-six minutes past one afternoon in west longitude twenty-six degrees thirty minutes and a quarter, and in the southern latitude of sixty-three degrees forty-five minutes and a half. The node is in the tenth sign thirteen degrees.

The Moon reappears on the 12th, being now in the constellation of the Goat, to the south of the ecliptick; and her southern latitude daily increases to the 17th, when it is at noon five degrees seventeen minutes, in the thirteenth degree of the first sign. Her path, therefore, lies through an uninteresting region; and she passes the small stars in the tail of the Goat in the morning of the 13th. On the 16th, she is on the meridian at twenty-seven minutes past four in the afternoon, having above her the four stars in Square to the west of it; and on the 17th on the meridian at ten minutes past five, being now under the small stars in the band of the Fishes. She now bends her course towards the ecliptick, to her ascending node, which she passes on the 23d, near midnight, and it is placed in the thirteenth degree of the fourth sign. Her course, therefore, lies between the stars in the head of the Ram and those in the head of the Whale, above Aldebaran and under the seventh and twelfth of the Twins. Her appulse to the meridian is each evening sooner than that of the preceding by upwards of fifty-six minutes on an average; the difference on the 18th being three quarters of an hour, and on the 23d and 24th an hour and four minutes. From the latter time, the difference between the times of appulse diminishes. On the 20th, when on the meridian, she is nearly under the Pleiades; and on the 21st, Aldebaran, with the Hyades, is seen to the west of her. On the 22d, she has the seventh and twelfth of the Twins to the east of her. On the 23d, we perceive the sixth of the Twins near to, and almost directly under her, and she passes afterwards very near to the fourth.

From the 23d, the northern latitude of the Moon increases, and becomes greatest on the 29th; and it is at midnight upwards of five degrees fourteen minutes, the Moon being then advanced twelve degrees in the seventh sign. In the former part of its progress, no planet was in its path; but now, Jupiter, at a considerable distance to the east of her, will attract attention. She passes under the two first of the Twins on the 24th, directs her course through the barren region of the Crab on the 25th, and passes between the first and seventh of the Lion on the 26th; and on the 28th she passes above the second of the Virgin; and on the 29th the seventh and third of this constellation and Jupiter, passing between the third and fourth of the Virgin. From the 29th, she bends her course towards the ecliptick to her descending node, which she arrives at on the 6th of next month, situated near twelve degrees three quarters in the tenth sign. In this part of her progress, during this month, her recess from Jupiter will be the chief object. She passes the first of the Virgin at a considerable distance, and does not reach the two first stars of the Balance.

Mercury is a morning star, being in his superior conjunction on the 31st; but only the keen astronomer will make observations upon him, as his height on the 1st is only nine degrees at Sun-rise; and this height, from his passing his descending node on the 2d, and his southern latitude rapidly increasing, will every day diminish. His distance from the Sun, at first, is only sixteen degrees.

Venus would be an evening star, if her distance from the Sun were sufficient to give free exercise to her splendour; but on the 1st she is not a degree and a half from him, and on the 31st not nine degrees.

Mars is a morning star, being about fifteen degrees from the meridian at Sun-rise. His motion is direct through twenty-one degrees, from a point to the west of the second of the Scorpion, as he passes this star on the third, when it is only forty-four minutes from him, the star being above him; and on the 4th the twenty-fourth, at the distance of only two minutes. On the 10th, he passes the planet Herschell, and the distance between them is only seven minutes, Mars being the highest. He passes now through an uninteresting region, finishing his course in the western branch of the Milky-way, above the eighth of the Serpent-bearer, his path being very near the ecliptick, as on the 1st he was only nineteen minutes from it, and passes it in his descending node on the 29th. Jupiter on the 1st is forty-nine degrees from and to the west of him, and this distance is daily increasing. The Moon passes Mars on the 6th.

Ceres is on the meridian on the 1st at three minutes and a half past eleven o'clock at night, being in the barren space between the horns of the Bull, having under her a little to the west the tenth of this constellation, and to the west, but very little below her, the small star 179. To this she is directing her course with a retrograde motion; and she passes it on the 18th at the distance of only forty-four minutes, the star being to the south of her. On the 17th she is on the meridian at three quarters past nine at night, when this star will be under her to the west, and on the 18th, when on the meridian, under her to the east. She now continues her motion slowly from this star westward, and of course it will be a good direction to us this month; but hereafter we may find better stars for this purpose. Her northern latitude, at first one degree six minutes, increases to nearly two degrees forty minutes. The Moon passes her on the 22d.

Jupiter is on the meridian on the 1st, at fifty-three minutes past five in the morning, and on the 20th at thirty-four minutes past four, rising at first about a quarter past eleven at night, and at the latter time about ten. His motion is direct to-the 26th, and after that day retrograde, of course very slow, as it is little more than three quarters of a degree in the direct course. When on the meridian, we shall see above and near to him on the west, the third star of the Virgin, and below him, at some distance, the first. The Moon passes him on the 2d, and again on the 29th.

Saturn is in conjunction with the Sun on the 23d, about noon; and consequently will be too near to it, both before and after this time, to attract general attention. The keen astronomer will, however, in the first week, discover him soon after Sun-set near the horizon, in the south-west. The Moon passes him on the 11th.

Herschell is a morning star, but he is on the meridian at Sun-rise on the 26th. He will be best discovered by means of the planet Mars, who passes him on the 10th at the distance of only seven minutes, Mars being to the north. We shall be prepared for this observation by the motion of Mars from the second of the Scorpion, which he passes on the 2d; and as Herschell has a motion of only eighty-three minutes, by noticing his place when Mars passes him, we may retain it with ease during the rest of the month.

The motion is direct, and under the small star the twenty-third of the Scorpion. The planet himself is only about seven minutes distant from the ecliptick the whole month to the north of it. The Moon passes him on the 6th.

The apparent diameter of the Sun on the 11th is thirty-two minutes thirty-five seconds, and on the 23d thirty-two minutes thirty-three seconds. The apparent diameter of the Moon is at midnight of the 1st thirty-one minutes forty seconds, and it decreases to the 11th, when it is twenty-nine minutes forty-six seconds. It then increases to the 25th, and at noon of that day it is thirty-three minutes thirty-two seconds; and it then decreases to the end of the month, ending with a magnitude of thirty minutes fifty-two seconds.

For the positions of the stars, see the description of them for any hour of the night, in the volume for 1806, according to the following table.

TABLE OF POSITIONS.

Pos.	1		8		16		24	
	h.	m.	h.	m.	h.	m.	h.	m.
X.	4	43	4	12	3	38		
XI.	6	44	6	13	5	39	5	5
XII.	8	50	8	19	7	45	7	11
I.	10	40	10	9	9	35	9	1
II.	0	43	0	12	11	38	11	4
III.	2	32	2	1	1	27	0	53
IV.	4	53	4	22	3	48	3	14
V.	6	44	6	13	5	39	5	5
VI.			8	9	7	35	7	1

FEBRUARY, 1815.

I HAVE introduced, you perceive, in page 14, a new planet to your acquaintance; and for this I am indebted to an astronomer of great celebrity, Bode of Berlin, whose very useful work is noticed in a former volume.

This planet was discovered in the year 1801, by Piazzi, a celebrated astronomer in Sicily; and the fantastical name of Ceres was given to it, in compliment to the heathenish appellation, by which all the other planets, except Herschell, are designated. This Ceres was one of the abominations worshipped by the polite Greeks and Romans, and had her share in the fictions, with which our younger years are amused, or, shall I say, abused. When man had lost sight of his Creater, and given himself up to the fancies of a deluded imagination, the poet and the priest went hand in hand together in corrupting his mind, and peopling the heavens with a variety of personages, before whose statues the besotted race degraded themselves with bended knee and vain oblations. The names of several of these intruders were imposed on the days of the week, and the stars of heaven; thus continually calling to mind the objects of daily worship. The two most beautiful planets still bear the names of a prostitute and a wretch degraded by every vice, and, when we use their appellations, it should be with heartfelt gratitude, that, through the light of Christianity, the knowledge of one only God is proclaimed throughout the world. Why the present race should follow this miserable nomenclature, it is difficult to assign a tolerable reason: surely, in the events of modern times, or in the names of the discoverers, or in those of celebrated philosophers, might have been found more appropriate appellations.

It had long been conjectured, that the spaces between the orbits of Mars and Jupiter, Jupiter and Saturn, contained bodies revolving round the Sun: for such a magnitude of empty space seemed to the conjecturers to be a defect in creation. The reasoning, however, of this conjecture does not seem to rest on any solid foundation: for, if you conceive a sphere, whose diameter is the diameter of the orbit of Saturn, the part occupied by the known heavenly bodies within it, bears a very small proportion to that, which is apparently free from any such bodies. On a sudden, four planetary orbs have been discovered between the orbit of Mars and Jupiter, and who can say that more do not exist; and, in the same manner, future time may discover new planets between the orbits of Jupiter and Saturn.

These four planets are very small in comparison with the others. The discovery of Piazzi set astronomers at work, and in a short time three more planets made their appearance; and, what is extraordinary, all the four are, when we consider the interval between the other planets, near to each other. Ceres is the farthest from us, and its distance from the Sun is about two hundred and sixty millions of miles. As a name was found for this planet from the stupid mythology of the ancient Greeks and Romans, the three other planets were sent to the same source for their appellations. The nearest to Mars was called Vesta; the next Juno; Pallas and Ceres came next; and the distance of Pallas is scarcely sufficiently determined, for by some it is made greater, by others less than that of Ceres. This must be expected to be the case for a little time; but, after a proper number of observations, the orbits of these small bodies will be determined with as great accuracy as those of the other planets.

The times, in which these small planetary bodies perform their revolutions, are set down by Bode in the following manner: Vesta goes round the Sun in three years two hundred and twenty-four days; Juno in four years one hundred and thirty-one days; Pallas in four years two hundred and twenty days; and Ceres in four years and two hundred and twenty-one days. Now as there is only by this account a day's difference in the year of these two latter planets, their distances from the Sun must be nearly equal: but I shall wait for longer experience before I give full credence to either position. The difficulty of the subject is great, and considerable errours will be made at first in calculations; but these will be gradually corrected.

The smallness of these bodies, compared with the other planets, is such, that we must here make great allowance for variations. This smallness accounts for their having been so long undetected; and the present discoveries may indeed lead us to expect, that many more of a similar nature may be revolving around us, which will be known to future ages, and change very materially their ideas of our solar system. Ceres is supposed to be fifteen times less than our Earth; Pallas thirty-seven times; Juno a hundred and eighty-three times; but Vesta's magnitude is not determined.

Great ingenuity has been employed in the endeavour to ascertain the magnitude of these bodies, and more will probably be used before the question is settled. Their inferior size has, however, given occasion to many conjectures on the part of the philosopher. Accustomed to contemplate such large bodies as Mars, Jupiter, and Saturn, the introduction of these diminutive orbs deranges his conception of the system. But great and small are relative terms; and as no reason can be assigned, why the larger planets should not follow any order in their sizes, so may it remain as inexplicable, why such small bodies should be introduced into the system. It is sufficient for us, that, as they do exist there, it must be for wise and good purposes; and the inhabitants of these smaller orbs may carry on social intercourse without the horrid scenes with which our Earth has been so often disgraced. We are lost, when we reason only from ourselves and the small tracts within our notice; and one great use of astronomy is to enlarge our minds, and, by contemplating other orbs, not to set too great a value either on ourselves or the objects of sense around us. But we will dismiss these speculations for the present, and proceed to the contemplation of the heavens as they will appear to us this month.

The Moon rises in the morning during the first part of this month, becoming new on the 9th, at thirty-one minutes past nine in the morning. On the 6th, it passes the eclíptick in its descending node, about six in the morning, the place of the node being the thirteenth degree of the tenth sign. Her northern latitude on the 1st at midnight is four degrees five minutes, in the twenty-second degree of the eighth sign. On the 1st she rises above the two first stars of the Balance, passing the third at a quarter past two in the morning of the 2d. She is directing her course above Mars, considerably to the east of her; and she passes this planet on the 4th, so that she will be seen rising under him on the 6th; her recess from him carries her through the Milky-way, and under the small stars in the head of the Archer; and she passes the Sun on the 9th.

We may expect to see the crescent of the Moon again on the 10th in the evening, but it must be near the horizon and soon after Sun-set. At midnight of this day it is four degrees nineteen minutes south of the ecliptick, and its southern latitude increases to the 13th, when at noon it is five degrees nine minutes, the moon being then in the tenth degree of the first sign. From about this time she takes a northerly direction, and passes the ecliptick in her ascending node on the 20th, in the morning, her place being then in the twelfth degree of the fourth sign. Her northern latitude from this time increases, till it becomes nearly five degrees six minutes at noon of the 26th, being then in the fourteenth degree of the seventh sign, after which it decreases.

On the 11th, the Moon is seen in the uninteresting space to the south of the ecliptick under the four stars in Square, and she is directing her course under the small stars in the band of the Fishes, to the small stars in the head of the Whale, near which she will be, when on the meridian, on the 15th, at thirty-four minutes past four in the afternoon, as she passes the twelfth of this constellation at twenty minutes past nine in the evening at the distance of a degree, the star being south of her. On the 16th she is on the meridian at twenty-three minutes past five, having the Pleiades above her to the east, and she arrives every day later at the meridian by an average of fifty-seven minutes a day till the full Moon. On the 17th she is seen between the Pleiades and Hyades, passing the latter and Aldebaran before midnight; and she passes the first fourth of the Bull at eight minutes past six in the evening, at the distance of fifty minutes; and the second fourth at nearly three quarters past six, at the distance of fifty-nine minutes, being north of both stars. Her course is now directed under the seventh and twelfth of the Twins, which stars she passes on the 19th, passing in her way near the sixth of the Bull, the distance being only twenty-eight minutes, and the star being south; and on the 20th we perceive her, when on the meridian, to be directly under the two first stars of the Twins. From them she directs her course through the barren regions of the Crab, to pass between the first and seventh of the Lion; and we shall see these stars to the east of her on the 22d; but on the 23d, they will be to the west of her. On this latter day is full Moon, without an eclipse, at sixteen minutes past eight in the morning.

From the direction of the Moon previous to its full, we perceive her course to be through the five stars in triangle of the Virgin, under which is Jupiter, and we daily notice her approaches towards him; and on the 25th, she is seen above the third of the Virgin, evidently to pass the third and fourth of the constellation, and to be seen below this planet on the following nights. She now directs her course through the two first stars of the Balance, between which we shall perceive her to pass during the last night of this month, evidently directing her course to Mars, on the other side of the Scorpion, and at a considerable distance from her.

Mercury is an evening star, too near the Sun to be visible at first, but at such an altitude above the horizon at Sun-set, at the latter part of the month, that he will present himself to many observers. On the last day this height is very nearly fifteen degrees, and he will be about an hour and forty minutes above the horizon after Sun-set. About an hour, therefore, after Sun-set, we may, for the last week of the month, discover him near the horizon in west by south. He is to the west of the line drawn through the two eastern of the four stars in Square and produced. The Moon passes him on the 10th, early in the morning.

Venus is an evening star, too near the Sun at first to be visible; but, during the latter part of the month, she will attract our attention in west by south, though she does not attain to the height that Mercury has on the last day of the month. Their distance from each other on that day is nearly four degrees, Mercury being to the east of Venus. As the Moon will give no obstruction, and at this season the evenings are dark sufficiently soon after Sun-set, there will be, if the nights are fair, ample opportunities, such as the keen astronomer will not miss, of comparing together these two planets. The motion of Venus is direct through thirty-five degrees. Her latitude is south on the 1st a degree and twenty-six minutes, and it increases about three minutes more, commencing its decrease on the 11th, and diminishing to one degree seventeen minutes. Her course, in the latter part of the month, is in the barren space south of the ecliptick, between the lines drawn through the two eastern and the two western of the four stars in Square, but she does not reach the former line. The Moon passes her on the 10th.

Mars is a morning star, at a considerable distance from the Sun, though he does not reach the meridian for some time after Sun-rise. His motion is direct through nineteen degrees and a quarter, from a point in the leg of the Serpent-bearer to the west of the star *c*, as he passes it on the 2d, at the distance of thirty-five minutes, being south of it. He is the whole time near the ecliptick, to the south of it, as his latitude is first two minutes south, and it increases only to about twenty-six minutes. His progress is through a region interesting only from the branch of the Milky-way, through which he passes in the middle of his course; and he will be between the eleventh and twelfth of the Archer on the 19th, but nearest to the former star. The Moon passes him on the 4th.

Ceres is on the meridian at forty minutes past eight at night of the 1st, and at forty-one minutes past seven on the 17th. She moves with a direct motion through three degrees, and being first to the west of the star 179 of the Bull, she passes it on the 10th, at the distance of nearly two degrees. Her northern latitude increases considerably during this month; it was first two degrees forty-one minutes, and it increases to three degrees and a half at the end of the month. She is directing her course to the second of the Bull, or tip of the northern horn, which will be a better direction to her next month. The Moon passes her on the 18th.

Jupiter is on the meridian at three quarters past three in the morning of the 1st, and near two on the 26th. His motion is retrograde, through a degree and three quarters, having the third of the Virgin to the west of him, under which he is directing his course; but he does not pass it till next month. We shall therefore notice to the west of him the five stars in triangle of the Virgin, and to the east the first of this constellation. The Moon passes him on the 26th.

Saturn is a morning star, too near the Sun to be visible in the former part of the month; and at the close of it, he will be only between seven and eight degrees above the horizon at Sun-rise in the south-east. His motion is direct through three degrees ten minutes, being under the two first stars of the Goat; and his latitude, on the 1st, twenty-seven minutes south, increases to only twenty-nine minutes. On the 10th he is only forty-three minutes from the thirteenth of this constellation, to the south of the star. The Moon passes him on the 8th.

Herschell is a morning star, on the meridian a little before Sun-rise on the 1st, and on the 21st at nearly six o'clock in the morning. His motion is direct through thirty-seven minutes, and his northern latitude concludes nearly the same, about seven minutes. When on the meridian he has almost directly under him Antares, and he will be discovered by directing the glass to the twenty-fourth of the Scorpion, and then moving it to the westward of that star. The Moon passes him on the 3d.

The apparent diameter of the Sun is on the 3d thirty-two minutes and a half, and on the 19th thirty-two minutes twenty-four seconds. The apparent diameter of the Moon is on the 1st, at midnight, thirty minutes twenty-six seconds; and it decreases to the 7th, when it is twenty-nine minutes twenty-six seconds. It then increases to the 22d, being on that day thirty-three minutes eighteen seconds; and decreases to the end of the month, ending with a magnitude of thirty minutes fifty-eight seconds.

The positions of the stars for any hour will be known by consulting the volume for 1806, according to the following table:

TABLE OF POSITIONS.

Pos.	1		8		15		22	
	h.	m.	h.	m.	h.	m.	h.	m.
XI.	4	32	4	4				
XII.	6	38	6	10	5	42	5	15
I.	8	28	8	0	7	32	7	5
II.	10	31	10	3	9	35	9	8
III.	0	20	11	52	11	24	10	57
IV.	2	41	2	13	1	45	1	18
V.	4	32	4	4	3	36	3	9
VI.	6	28	6		5	32	5	5

MARCH, 1815.

THE distance of the fixed stars is so great from us, that their magnitude is not to be ascertained. The angle, which they subtend to our eye, improved by the utmost power of present instruments, is too small to be measured. The small dimensions of the new planets, combined with their distance, produce nearly the same effect, at least a very great uncertainty in their measures. They evidently appear to us only by means of the light of the Sun reflected by them, and as they appear only like stars of the sixth or seventh magnitude, common observers would not easily distinguish them from fixed stars; and the best observers have probably, from the same reason, passed them by unobserved. Now that their motions are ascertained, and their places marked out with tolerable accuracy, these mistakes are not likely to occur again. The astronomer will follow them with his nightly glass, when they are above the horizon, and the tracing out of their path will lead to new discoveries.

The difference between the new and the old planets in size and motion has introduced a new name into astronomy; and a distinguished observer of the heavens among us, conceiving them to be of a mixed nature, between stars and planets, wishes them to be called asteroeids. Something in the indefiniteness of their light is to give them the resemblance of stars, whilst their motion round the Sun connects them with the other planets. But, as they shine with light borrowed from the Sun, I do not see why the appearance arising merely from their minuteness should cause any alteration in the names of these bodies. The reason also given, by the same observer, why they should not rank as planets, does not appear more satisfactory: for they are wandering bodies; as the planets, they move round the Sun, and their orbits are contained within two of the orbits of the greater planets.

But it is said, that they differ from the planets in the inclination of their orbits; and they derange our received system, by which the planets are contained within the limits of the zodiack. If new bodies should be discovered, of the same kind, passing, perhaps, through the pole of the ecliptick, what will become of our general rules, of all our marks? We shall then no longer be able to say, that the planets move round the Sun in a direction from west to east; and, perhaps, we may be forced to alter our rule, and say the planets move round the Sun in every direction.

The comets, we find, follow no rule in their motions; and ours, with regard to the planets, is in fact arbitrary. The Moon and six large planets have been observed not to deviate far from the ecliptick, and hence the usual boundary has been fixed at eight degrees on each side of it. The zodiack will remain the same, though new planets should wander beyond it; and, if a distinction is to be made on this account, the terms zodiacal and extra-zodiacal are at hand to suit our purpose. The old planets need not change the present appellations, and the new ones, which go beyond the zodiack, may be called extra-zodiacal.

In fact, we should always go to the first meaning of words. A planet is so called merely because it is perceived to wander in the heavens. The limits of its wanderings were not taken into consideration, by those who fixed this name on certain luminous orbs. On observing the heavens, they perceived there two sorts of bodies, one apparently fixed in their positions with respect to each other, the other changing their places among the fixed orbs. To the one sort was given the name of stars; to the latter, that of planets, or wanderers. The distinction of shining by their own or a borrowed light did not, for a long time after most probably, strike the minds of the observers; nor were the limits of their wanderings noticed for ages, probably, after they had received their appellations.

When men began to observe the heavens with more attention, and to divide the stars into constellations, it was seen, that these wanderers passed through certain constellations, and their appulses to certain stars in them were noticed. By degrees it was perceived, that they were confined only to these constellations; and at last, from this circumstance, the twelve constellations through which they and the Moon passed, obtained the name of the zodiack. The limits of this zodiack were afterwards confined within narrower limits, as the wanderers were found to be more restrained in their motions; and thus it is, that many stars in the constellations of the zodiack are without its present limits.

We have now a new set of wanderers, and an abundant harvest of them may be reaped; and one very great advantage attends their passing our former boundaries. The astronomer will no longer confine his attention, as he has been too much accustomed to do, to the zodiack; but, in tracing the new wanderers, he will examine attentively every thing in their progress. The path of the new planet will be accurately observed. In it, new heavenmarks will be fixed, and by them other bodies may be seen to pass. Thus, as the world grows older, the sphere of human knowledge will be improved; and singularities may be observed in the motions of the new bodies, which may excite still farther enquiries, and rectify our notions, perhaps even with respect to those bodies which have been so long under our observation. But it is time to attend to the appearances which take place in the heavens this month, in which Ceres has better marks for our observations.

The Moon rises in the morning, commencing her last quarter, on the 2d; and the new Moon will take place on the 11th, at twenty-one minutes past three in the morning. She passes the second of the Scorpion on the morning of the 2d, and Mars at twenty-five minutes past eleven in the morning of the 5th. She is travelling to her descending node, having, at noon of the 1st, a northern latitude of three degrees and three quarters, being then in the twenty-fourth degree of the eighth sign. She arrives at her node on the 5th, about nine in the morning, being then in the eleventh degree of the tenth sign; and now her southern latitude increases rapidly, so that, at the new Moon, it is nearly four degrees and three quarters; and, consequently, there cannot be an eclipse. Mars is the chief object of importance in her course; though, after her passage by him, we shall notice her access to, and recess from Saturn. The passage by him will take place in the afternoon of the 7th; and, consequently, will not be visible to us.

The crescent of the new Moon will be visible to us, in the evening of the 13th, in the west, being under the three first stars of the Ram, and at a considerable distance from them. Her latitude is southern, and, at midnight, four degrees fifty minutes, being less by eleven minutes than it was on the preceding day. Of course, it continues to decrease till the Moon comes to her ascending node, which she does on the 19th, about half an hour before noon, being then in the tenth degree of the fourth sign. Her northern latitude then commences, and increases to the 25th, when it is five degrees, at noon, in the eighth degree of the seventh sign; and, as the full Moon takes place on the morning of this day, at thirty-seven minutes past six, there can be no eclipse. Her northern latitude now decreases, till it arrives at its descending node, which it does on the 1st of next month, in the ninth degree of the tenth sign.

In the progress of the Moon from its first appearance, we notice the direction of its course under the Pleiades, between which and the Hyades she passes on the 16th; and, on the 19th, she is on the meridian at seven minutes past seven in the evening, having the fourth of the Twins near to and above her to the east, and the sixth below her to the west of the meridian; the two first stars of the Twins are, therefore, considerably above her to the east of the meridian.

Every succeeding night, to the full Moon, she passes the meridian later by fifty-seven minutes on the average. Her passage is under the two first stars of the Twins, through the dreary region of the Crab, and between the seventh and twelfth of the Lion, between which latter stars she passes on the 22d; as we shall perceive, on the first appearance of these objects, she will then just have passed the line between them. Her course is now directed through the five stars in triangle of the Virgin, passing between the second of the Lion and the second of the Virgin on the 22d, but nearest to the latter star, as we may perceive at their first appearance, when she will be seen to have passed the line between these two stars, and to be directing her course to Jupiter. Her passage by this planet takes place a little before noon on the 25th, as we shall perceive on the evening of that day, when Jupiter, the Moon, and the first of the Virgin, form a groupe to be noticed.

From the 25th, the recess of the Moon from the first of the Virgin and Jupiter will be the chief object of attention. Her brilliancy will so overpower the tenth and eleventh of this constellation, that few will notice them, though they cannot mistake her direction between the two first stars of the Balance, between which she passes on the morning of the 28th. She is now directing her course by the second of the Scorpion to Mars, and the star she passes on the morning of the 29th, and Mars will be seen at such a distance from her, that it is evident she cannot reach him this month. Her daily approaches to him will however be perceived, every morning, to be considerable.

Mercury is in his inferior conjunction on the 15th, in the evening; consequently, it is at the beginning and the end of the month only, that we must expect to discover him. At first he is an evening star, and at Sun-set he is nearly sixteen degrees above the horizon, in the west south-west; but this height is daily diminishing, since he is stationary on the 6th, and from that time retrograde. He is again stationary on the 28th, but then he is a morning star, and in as unfavourable a position for rising, as he was before advantageously situated to be observed as an evening star. None but the keen astronomer will see him during the latter part of the month. The Moon passes him on the 11th.

Venus is an evening star, not fifteen degrees above the horizon at Sun-set on the 1st; but this altitude is daily increasing, so that she will be a pleasant object in our evening walks in the west-south-west. Her motion is direct through thirty-eight degrees, from a point in the barren space to the south of the ecliptick, between the lines drawn through the two eastern and the two western of the four stars in Square and produced, until she comes near to the ecliptick in the third degree of the second sign, being then under the line between the stars in the heads of the Ram and of the Whale. On the 1st, her southern latitude is one degree seventeen minutes; and it decreases till it becomes ten seconds. On the 4th, she passes Mercury at noon; and the previous appearances of these two planets will excite attention. Her course lies through an uninteresting region. She passes the line drawn through the two eastern of the four stars in Square and produced on the 6th, the sixth of the Fishes on the 18th, and the fifteenth on the 25th, distance of star sixty-seven minutes to the south. The Moon passes her on the 12th.

Mars is a morning star, appearing first in the small stars under the head of the Archer, and moving with a direct motion through twenty degrees, and finishing his course in a line almost with the two first stars of the Goat. On the 1st, his latitude is twenty-seven minutes south, and this daily increases, till it becomes a degree. On this day he passes the thirteenth of the Archer in the morning, at the distance of thirty-four minutes, the star being north of him. As he is directing his course through the barren space between the Archer and the Goat, we shall have nothing to attract our attention during his progress, but his daily recess from the small stars in the head of the former, and his approach to the two stars in the head of the latter. We call them two stars, though the highest of the latter stars is a double star, evidently so to the naked eye. The Moon passes him on the 5th.

Ceres is on the meridian at nearly four minutes past seven in the evening of the 1st, and at twenty minutes past six of the 17th. Her northern latitude, on the 1st three degrees thirty-two minutes, increases to four degrees and a quarter. The bright star, the second of the Bull, or tip of his northern horn, is now our direction to her, as she passes it on the 19th, the star being one degree twenty-four minutes to the north of her.

To this day of course the star will be to the east of her, as her motion is direct; and during this month she passes through eight degrees. The Moon passes her on the 18th.

Jupiter is on the meridian on the 26th, at midnight, at which time he rises when the Sun sets, and affords therefore during the night very fine opportunities for observations on his orb and his moons. His motion is retrograde through three degrees and three quarters, under the seventh and third of the Virgin, passing the third on the 8th, at the distance of a degree and a quarter, but he does not arrive at the middle point under these stars this month. He rises during the month about a half point to the south of east. His latitude is northern on the 1st one degree thirty-four minutes, and it is increased only by three minutes in the course of the month. The Moon passes him on the 25th.

Saturn is a morning star, from the unfavourableness of his position on the 1st only about ten degrees above the horizon in the south-east at Sun-rise; but this height is daily increasing; so that at the end of the month he is about sixteen degrees above the horizon, in south-east by east, at Sun-rise. His motion is direct, through nearly three degrees, as will be noticed by observing his recess eastward from the two first stars of the Goat, under which he is, about seven degrees from the line drawn through them and produced. His latitude on the 1st is twenty-nine minutes south, and it increases to thirty-three minutes. This planet, therefore, and Mars, decorate the lower region of the eastern hemisphere during this month in the morning. The Moon passes Saturn on the 7th.

Herschell is stationary on the 10th, after which his motion is retrograde, through about ten minutes, his latitude continuing about seven minutes north during the month. On the 2d, he is on the meridian at half-past five in the morning, having directly under him Antares, and on the 22d at a quarter past four, being then nearly in the same position. He is moving towards the 24th of the Scorpion. The Moon passes him on the 2d.

The Sun's apparent diameter on the 6th is thirty-two minutes sixteen seconds, and on the 18th thirty-two minutes ten seconds. The Moon's apparent diameter on the 1st at midnight is thirty minutes and a half, and it decreases to the 6th, on which day it is twenty-nine minutes and a half. It then increases to the 22d, becoming thirty-two minutes fifty-two seconds; from which time it decreases to the end of the month to a magnitude of twenty-nine minutes fifty-four seconds.

For the appearances of the fixed stars consult the volume for 1806, according to the following table:

TABLE OF POSITIONS.

Pos.	1		8		16		24	
	h.	m.	h.	m.	h.	m.	h.	m.
I.	6	38	6	12	5	43		
II.	8	41	8	15	7	46	7	17
III.	10	30	10	4	9	35	9	6
IV.	0	51	0	25	11	56	11	27
V.	2	42	2	16	1	47	1	18
VI.	4	38	4	12	3	43	3	14
VII.	6	38	6	12	5	43	5	14

APRIL, 1815.

THE magnitudes of the heavenly bodies cannot be brought to any systematical arrangement. As we move from the Sun we come to Mercury, the smallest of the old planets: then to Venus, which exceeds it very much, and is within a tenth as large as the Earth: as we proceed farther we come to Mars, and there our proportion of size decreases; for he is between four and five times smaller than the Earth: advancing farther, we come to Jupiter, and now our proportion is changed in a most extraordinary manner; for he is between fourteen and fifteen hundred times greater than the Earth: but now we have arrived at our maximum; for on going forward to Saturn, we find him to be only a thousand and thirty times greater than the Earth: and when we come to the last discovered limit of our planetary system, Herschell, whom we should expect to find a very large body, is only eighty-three times greater than the Earth. The Sun, in the center of our system, is between five and six hundred times greater than the Earth and all these bodies put together.

Had a philosopher planned the system upon paper, he would most probably have formed a very different arrangement, either diminishing the bodies as they receded from the Sun, or, if he made the Mercury the smallest, he would then increase them in some proportion to the distance. This idea of regularity and system may suit the finite capacity of man, but in this Earth alone we see that it is not consistent with the operations of God. Immense plains and towering mountains, Alps upon Alps, manifest the difference between nature and art. The petty proportions of a petty temple, or a petty palace, may suit the littleness of the being, who cannot enlarge his thoughts to the bolder features of nature: but let him beware of introducing his limited proportions in examining the structure of a world. We talk of the magnitude of the bodies around us; but how inadequate are our conceptions of any of them. Their places in the system, and their magnitudes in consequence, are points far out of our reach to discuss. All that we can do is to admire that wisdom, which preserves them in their regular courses, perfectly convinced, that, in whatever manner the system had been arranged, the means would have been equally easy in the hands of Omnipotence for its support.

We are not then to wonder why the newly discovered planets were not made larger than they are, or why there should be four revolving so near to each other, when nothing similar to it is seen in other parts of the system. A conjecture has, however, been started, why there are four in this place instead of one, and it is not without its ingenuity; but, unfortunately, we have no sure grounds to rest upon, if we were inclined to admit it. How can man place himself at the right hand of creative power, or form a just conception of that chaotick mass, which preceded the formation of light!

The conjecturer imagines, that in the same manner as the Earth was formed, so were all the planets, the motion round the axis and in their orbits being given at the same time. In the middle space, between the orbits of Mars and Jupiter, was a mass of matter, on the point, we may say, of being converted from its chaotick state into a planet, when a mighty convulsion from within split it into four parts, each of which, proceeding by the regular impulse on the other planets, moved round the sun, and became a planet. Our Moon might, in the same manner, be supposed to have been thrown off from our Earth, and the moons of Jupiter, Saturn, and Herschell from their respective planets. As Mercury, Venus, and Mars, are without moons, the process with them must be supposed to be more tranquil: but I fear that the conjecturer will find no small difficulty, with his convulsions of Saturn, to form from them the ring about this wonderful orb.

We are allowed certainly to speak of creation, since a sufficiently detailed account is given of it in the first book of Genesis; and the idea of a mighty convulsion is by no means repugnant to our sacred writings. We learn, that at first there was a chaotick mass, with a mighty gaz, agitating its surface. Light, by the divine command, first emerged from the great confusion; then air; the waters subsided, and the dry land appeared. In these changes, doubtless we may conceive the convulsions supposed by our conjecturer; and mighty masses might be thrown from place to place, sufficient to form moons or to separate one mass into four planets. But here we are soaring too far; for we cannot form any idea of the extent of the chaotick mass, nor the manner in which the divine will separated it into the portions which we now behold. He formed larger or smaller bodies, according to his own pleasure; and it is no more inconsistent with the divine plan, that there should be four bodies in one space, than that there should be so large a one as Jupiter in another, or so small a one as Mercury in another part of his system. We will therefore dismiss this conjecture, and proceed to note the appearances that will take place this month.

The Moon rises in the morning of the 1st, passing between the eleventh and twelfth of the Archer, but nearest to the former star. Her latitude at noon is nearly two minutes south in the ninth degree of the tenth sign, and this increases to the day before the new Moon, when it is at midnight five degrees south, in the tenth degree of the first sign; and at the time of new Moon, which is at twenty minutes past six in the afternoon of the 9th, it is four degrees fifty-three minutes, and consequently there cannot be an eclipse. She passes her descending node, on the 1st, a little before noon, and directs her course under the small stars in the head of the Archer, to the east of which stars she will be seen on the morning of the 2d. Before her we shall notice Mars and Saturn; but, as she passes under Mars in the afternoon of the 3d, we shall see her at some distance to the east of him on the morning of the 4th; and soon after her rising she will pass Saturn, and thus give an interest to the lower region of the eastern hemisphere in the south-east. Her course is now directed to the small stars in the tail of the Goat, and we lose her in the barren region under the four stars in Square.

The crescent of the new Moon is seen in the evening of the 11th under the Pleiades to the north of west. Her latitude at noon on this day is four degrees seven minutes south, in the twelfth degree of the second sign, and it is daily decreasing till she comes to her ascending node at noon on the 15th, her place being then in the seventh degree of the fourth sign. Her course lies therefore by the Hyades, to the west of which stars we shall see her on the 12th, and to the east of them on the 13th; she passes the sixth of the Bull about noon of the 14th, and we shall therefore see her to the east of this star on the evening; and the next evening, the 15th, we shall perceive, that she has passed the seventh and twelfth of the Twins. Her northern latitude increases to the 21st, when it is nearly five degrees three minutes in the third degree of the seventh sign, and her course therefore lies above the fourth of the Twins, passing the line drawn through the two first on the 16th; and on the 17th, she is on the meridian at eight minutes past seven in the evening, being then in the barren region of the Crab, the two small stars and included nebula being near to her on the west. Her course is evidently directed through the space between the seventh and first of the Lion to Jupiter, at a considerable distance from her to the east, and her appulse to the meridian is every evening later on an average till full Moon of fifty-two minutes. On the morning of the 19th, she passes the first of the Lion, and consequently this star will be near to her to the east when on the meridian, on the 18th. Her course lies through the five stars in triangle of the Virgin, by her head, as she passes over the thirteenth on the 20th, about six in the evening. Under them is Jupiter, whom she passes on the 21st, from her great northern latitude, being then at some distance from him; and she now bends her course to her descending node, which is placed in the sixth degree of the tenth sign, and which she passes about three in the afternoon of the 28th.

On the 23d, is full Moon at seventeen minutes past five in the afternoon, and, from her great northern latitude, without an eclipse. Considerably to the west of her, we shall notice the first of the Virgin and Jupiter. Her splendour will obscure the tenth and eleventh of the Virgin, and her course lies through the space between the two first stars of the Balance, which she will have passed before her next appearance; and on the 25th, we shall notice her passage by the second of the Scorpion. Her course lies now through an uninteresting space, till she comes to her node; and on the 29th, she rises in the morning, when we shall see her by the small stars in the head of the Archer, below which she passes, as she is now bending her course south of the ecliptick. Before her, in the course of the morning, we shall notice Saturn and Mars; but she does not reach either of them this month, though these planets, with the two first stars of the Goat, will, on the morning of the 30th, form an interesting object to the east of her.

Mercury is a morning star, at his greatest elongation on the 14th; but, from the disadvantages of his position and his southern latitude, his height at Sun-rise is so small, that he will be detected only by the keen astronomer.

Venus is an evening star in a favourable position, passing her ascending node on the 6th; but her northern latitude increases afterwards to only one degree seven minutes. Her motion is direct, through thirty-six degrees and a half, appearing on the 1st under the line between the three first stars of the Ram and the first of the Whale, but nearest to the former stars. On the 7th, she passes the fifteenth of the Ram, this small star being thirty-six minutes from and south of her. She thence directs her course under the Pleiades to the small stars in the head of the Bull called the thirteenths. These she reaches on the 27th, passing the first thirteenth about six in the evening at the distance of seven minutes, the star being north of her; and on the 30th, the nineteenth of the Bull, about eight in the evening, the star being twenty-six minutes from and to the south of her.

Mars is a morning star, being seen at first under the two first stars of the Goat, and almost in the line with them. His motion is direct through twenty-one degrees, ending above and a little to the east of the small stars in the tail of this constellation. His latitude on the 1st, is one degree south, in the second degree of the eleventh sign, and increases to a degree thirty-seven minutes The chief feature in his course is his recess from the two first stars of the Goat and passage by Saturn, which takes place on the 15th, when he is only eighteen minutes from the latter planet, and to the south of him. On the 27th, he passes the third of the Goat, being distant fifty-eight minutes from and to the north of it; and on the 29th, the fourth of this constellation, the star being south of him, and at a distance of fifty-seven minutes. The Moon passes Mars on the 3d.

Ceres is on the meridian at three quarters past five in the afternoon of the 1st, and consequently we lose this direction to her. Her course is direct, through ten degrees, being at first in the middle of the Milky-way to the east of the second of the Bull or tip of the northern horn, and she finishes her course at a point above the fifth of the Twins, about three degrees and a half from this star. Her northern latitude, at first four degrees sixteen minutes, in the twenty-fourth degree of the third sign, increases to four degrees and three quarters; and thus, on quitting the Milky-way on the 21st, she passes to the north of another portion of it on the 25th, about a half degree from it. The Moon passes her on the 14th.

Jupiter is on the meridian on the 1st, at thirty-seven minutes past eleven at night, and on the 25th at ten. Consequently during this month, he will be very favourably situated for evening observations. His motion is retrograde, through three degrees and a quarter, first rising under the seventh of the Virgin, as she passes this star on the 20th. His latitude on the 1st is ninety-seven minutes north, and it slowly decreases, being less by about four minutes at the end of the month. He rises during the whole month very near the point of east, but always to the south of it. The Moon passes him on the 21st.

Saturn is a morning star, situated nearly midway between the two first stars in the head, and the four small stars in the tail of the Goat. His latitude is thirty-three minutes south on the 1st, in the eleventh degree of the eleventh sign, and increases to between thirty-six and thirty-seven minutes south. Mars is at first to the west of him, and passes him, as before observed, on the 15th, so that these two planets will, during the whole month, form an interesting object in the lower region of the eastern hemisphere about the south-east. The Moon passes Saturn on the 4th.

Herschell rises about midnight on the 1st, and is on the meridian at three in the morning of the 12th. The two first stars of the Scorpion are our guides to him, as Antares is nearly directly below him, when on the meridian; and the small star, the twenty-fourth of the Scorpion, being near the planet to the east, will conduct us nearer to him. His motion is retrograde, through fifty minutes, receding from the star to the west; his latitude continues about seven minutes north. He is nearly at equal distances from the first and second of the Scorpion. The Moon passes him on the 26th.

The apparent diameter of the Sun on the 4th is thirty-two minutes, and on the 24th thirty-one minutes fifty seconds. The apparent diameter of the Moon decreases to the 3d, when it is twenty-nine minutes thirty-four seconds; and it increases to the 18th, when it is at midnight thirty-two minutes twenty-six seconds; and it decreases to the end of the month, finishing with a magnitude of twenty-nine minutes thirty-eight seconds.

For the appearances of the fixed stars, at any hour of the night, consult the descriptions of their positions in the volume for 1806, according to the following table:

TABLE OF POSITIONS.

Pos.	1		8		16		24	
	h.	m.	h.	m.	h.	m.	h.	m.
II.	6	48	6	22	5	53		
III.	8	37	8	11	7	42	7	13
IV.	10	58	10	32	10	3	9	34
V.	0	49	0	23	11	54	11	25
VI.	2	45	2	19	1	50	1	21
VII.	4	45	4	19	3	50	3	21
VIII.			6	24	5	55	5	26

MAY, 1815.

THE small planets, whose discovery is so important an object to the astronomer, can, from their distance, afford little satisfaction to the common observer. Yet there is a pleasure in transporting ourselves in idea to such orbs, and contemplating the heavens as they would there appear to us. The fixed stars present to the inhabitants of these smaller worlds the same appearances as they do to us, though they may there be grouped into constellations of different forms from ours. But their planetary system will be very different, and some circumstances will attend it of a peculiar nature.

Venus and Mercury will not be visible to them; but, in their room, Mars and our Earth will serve as evening and morning stars. Jupiter, Saturn, and Herschell, will appear as superior planets, but each of them to far greater advantage than they do to us. The brightness and magnitude of Jupiter, when in opposition to the Sun, must give a very great degree of splendour to their heavens, which will be succeeded, however, by a great diminution in his light as he approaches to the conjunction. Herschell will there be familiar to the commonest observer; and in the contemplation of these three superior planets the astronomer will find sufficient employment.

But the appearances of the smaller planets will, to the inhabitants of each of these bodies, afford much matter for investigation. If Ceres is the most remote of them, then the other three are to her inferior planets: and, if Pallas is within two or three millions of miles only from her, then she will have at times, notwithstanding the smallness of the orb, a brilliant evening and morning star. The others, also, will be evening and morning stars, but with inferior degrees of splendour upon the whole, though all three may at times be seen above the horizon, when Vesta and Juno may be superior to Pallas in splendour.

Pallas will be however considered, by the inhabitants of Ceres, in the same light as Venus is by us. Yet there are curious particulars attending their nearness to each other. The angle of elongation of Pallas is not less than eighty degrees; but she will be stationary for a great length of time. For the two planets being supposed to go round the Sun nearly in the same time, the interval of its passage from the stationary point to the inferior conjunction will be very long; and, on the other hand, for the same cause, when Pallas is in its superior conjunction, the interval between its leaving that point and arrival to the next point of greatest elongation, must be very long; so that, in their astronomical records, Pallas will be noted as visible for a great number of years, and then invisible for a still greater number.

You will understand this by considering, that, according to the present account, these two planets go round the Sun in nearly the same time; since there is said to be only a day's difference in their revolutions. This being the case, they will appear to an inhabitant of the Sun, if they have at one time the same longitude, to continue to have the same longitude nearly during the whole year, though both are changing it daily. In the same manner, supposing one to be in her superior conjunction, she will continue nearly in it during the whole of her year, as at the end of it she will have apparently moved only from the Sun a space equivalent to one day's motion.

This will be seen better, however, by considering the interval, that will elapse between one superior conjunction and another, which amounts to a greater number of years than have elapsed since the creation of Adam. If we have been, then, so many years without the knowledge of these bodies, these near neighbours may also, for a long period, have been equally ignorant; and, if they do not keep better records than we have done, these near bodies may excite continual doubts, as they appear and disappear.

Another circumstance attends them, which makes a difference between them and our inferior planets. We lose sight of Venus and Mercury on account of their being overcome by the superior splendour of the Sun's rays. If this was diminished, with respect to us, and still the same quantity of light reflected from the inferior planet, we might see it during its progress behind the Sun, when it is not entirely covered by the disc itself. But it is not so with these smaller planets: for, owing to their diminutive size, when Pallas, for example, from her point of greatest brightness when viewed from Ceres, is moving towards the Sun, she will be lost in the heavens, though she is above, and the Sun under the horizon. Years upon years will glide away during this process; and if the inhabitants of Ceres are not longer livers than those on this Earth, they who are born a few years before Pallas arrives at its greatest splendour, may observe it, during their whole lives, as an evening star, with little diminution of its brightness. A parent will tell his child, that he has seen Pallas increase and decrease in brightness: the story may be propagated for a few generations, which will wonder that they see it continually less and less than tradition describes it to them; and at last, when it has vanished from their sight, conjecture may be afloat on the probability of its reappearance; and, when it does reappear, it will be long before it is ascertained, that this was the same object noticed so many thousand years ago. But I leave this to your meditations, and proceed to the business of the month.

The Moon rises in the morning on the 1st, commencing her last quarter at nearly noon, when her latitude is two degrees fifty four minutes south, in the eleventh degree of the eleventh sign, being then near to Saturn; and it increases to the 5th, when it becomes very nearly five degrees seven minutes at midnight, in the fifth degree of the first sign. It then diminishes to her ascending node, which she passes on the 12th, about five in the afternoon, in the sixth degree of the fourth sign; and as the new Moon takes place on the 9th, her latitude is then too great to admit of an eclipse. On the 1st, she rises above Saturn, but will be seen to have passed him at her next appearance, when she rises between him and Mars, and her passage by these two planets is the most important feature in her course, as in her recess from the latter planet she passes through the uninteresting space below the four stars in Square and the band of the Fishes.

The Moon reappears in the west in the evening of the 10th, when her crescent will be seen in the horizon near the west-north-west. She is then above and near to Aldebaran, and is directing her course between the horns of the Bull, passing between the stars in the tips on the 11th, being then seen nearly in a line with them, but nearest to the sixth. On the 12th, she is seen above the seventh and twelfth of the Twins, passing under the fifth. The two first will be noticed above her, as they will on the next night, for she is not in a line with them till she sets. As she passes her ascending node on the 12th, her northern latitude daily increases, and it continues to do so till the 18th, when it is at midnight five degrees ten minutes, her place being then four degrees and three quarters in the seventh sign; and her course then declines again to the ecliptick, till she passes her descending node on the 25th, which is placed in the fifth degree of the tenth sign, and she passes it about nine at night.

On the 14th, the Moon is seen near the nebula of the Crab, directing her course to the Lion; and we shall see her under the seventh and first of this constellation on the 15th, but above them on the 16th, as she passes between them in the morning of the latter day. Her course is now directed through the five stars in triangle of the Virgin above Jupiter, now considerably to the east of her; and on the 18th, she is on the meridian at forty-one minutes past eight in the evening, when she will be seen almost directly above the planet, and the seventh of the Virgin, the planet being to the west, and the star to the east of the meridian. From this point she directs her course between the third and fourth of the Virgin, but near to the former star, and they will be seen to the west of her on her next appearance on the meridian, the first being at some distance below her to the east. Her appulses to the meridian are every night later by forty-eight minutes, till the full Moon, which takes place on the 23d, at fifty-seven minutes past four in the morning. Her course is directed through the space between the first and second of the Balance, as will be seen on the 21st, when she passes between them near the first star; and, at the evening of the full, she will rise under the second of the Scorpion, directing her course through the barren space between the Scorpion and the Archer, passing under the twelfth of this latter constellation before she arrives at her node.

From her descending node on the 25th, the Moon's southern latitude decreases to the end of the month, when it becomes five degrees two minutes at midnight, her place being then in the eighteenth degree of the twelfth sign; and on the 25th, we see her followed in her rising by the small stars in the head of the Archer, under which she will have passed before her next appearance. This will be evident on the evening of the 26th, when the Moon will be seen rising under these stars; and about an hour after, Saturn will rise, being to the west of the two first stars of the Goat; and these objects will first fix the attention, though Mars, considerably farther to the east, will be noticed before Sun-rise. On the 27th, she rises under the two first stars of the Goat, which are to the east of her, and she passes them before Sun-rise; and, during the morning of the 28th, her passage under them, with approach to Saturn, to the east of her, will be a pleasing object to the traveller.

On the 29th, the Moon rises in the morning near to and under Saturn; and she directs her course, as will be apparent before Sun-rise, under Mars, now considerably to the east of her. On the 30th, she rises under and near to the small stars in the tail of the Goat, Mars rising very soon after her, though still at some distance from her to the east, and her recess from Saturn and approach to Mars will be the chief feature of the morn, in the lower regions of the eastern hemisphere. On the 31st, the Moon and Mars rise nearly at the same time, the great southern latitude of the Moon compensating for the greater nearness of Mars to the Sun; but, from the progress she makes towards him before Sun-rise, it is evident she will have passed him before her next appearance.

Mercury is in his superior conjunction on the 21st; and, consequently, a morning star till that time. The unfavourableness of his position, and his southern latitude, will prevent him being seen in the early part of the month; and he will be too near the Sun, after his conjunction, for the remainder of the month, to escape from the superior power of the solar ray. The Moon passes him on the 7th.

Venus is an evening star, to be detected by many at Sun-set, to the north of west; and our evening walks will be enlivened by her brilliancy, afterwards, in that quarter. Her motion is direct, through thirty-seven degrees, from her place in the head of the Bull, in the eleventh degree of the third sign, to a point above the fourth of the Twins, where she will be nearly in a line with this star and the second. At first, her latitude is one degree nine minutes north, and it increases to two degrees two minutes. In this long course, she passes first between the horns of the Bull, and, from her northern latitude, nearest to the tip of the northern horn, the star in which, or second of the Bull, she passes on the 10th. She now continues her course to the fifth of the Twins, passing the seventh and twelfth between the 18th and 21st, at the distance of about two degrees and three quarters, and she passes near to the fifth on the 23d; and now her daily progress under the two first stars of the Twins will shew more and more the superiority of her brilliancy. The Moon passes her on the 11th.

Mars is a morning star, being on the meridian at seven in the morning of the 8th, and at three quarters past six on the 20th. His motion is direct through twenty-two degrees, from a point about two degrees to the east of the small stars in the tail of the goat, to a point in the stream from the urn, midway between the eleventh and the twenty-first of the Water-bearer. His latitude, on the 1st, is one degree thirty-eight minutes south, and it increases to two degrees eleven minutes. His recess from Saturn is the chief feature of his course, and he passes the eleventh of the Water-bearer on the 26th. The Moon passes him on the 31st.

Ceres is an evening star, directing her course through the constellation of the Twins, and finishing it very near the tenth star in it. Her motion is direct through twelve degrees, and she passes the fifth of the Twins on the 8th, this star being about three degrees from her to the south; and she proceeds to the small star 285, which she passes on the 27th to the north of it, at the distance of fifty minutes. On the 31st, Venus passes her in the afternoon, at the distance of four degrees eleven minutes, Venus being to the south of her. The northern latitude of Ceres, at first four degrees forty-eight minutes, increases to five degrees and a quarter. The Moon passes her on the 12th.

Jupiter is on the meridian at thirty-five minutes past nine in the evening of the 1st, and at eight in the evening of the 24th. Thus we shall have Venus and Jupiter in the western hemisphere before the former sets on the 1st, Venus being near the horizon, and Jupiter near to, but to the west of the meridian. Their approach to each other will be an amusing object in our evening walks during the whole month. The motion of Jupiter is retrograde, through little more than a degree; his northern latitude, at first one degree thirty-three minutes, daily diminishing, till it becomes one degree twenty-six minutes. He is under the five stars in triangle of the Virgin, having when on the meridian the seventh near to but above him to the east, and the second at some distance from him to the west. From his position being now very near the autumnal equinoctial point, his duration above our horizon is about twelve hours: he does not pass this point till next month. The Moon passes him on the 18th.

Saturn is a morning star, not arriving at the meridian till after Sun-rise. His motion is direct, through only nineteen minutes, his latitude being south at first thirty-seven minutes, and at last forty-one. He is nearly in the middle space between the two first stars in the head, and the four small stars in the tail of the Goat. Mars is at some distance from him to the east, and this distance is daily increasing. The Moon passes him on the 1st and on the 29th.

Herschell is on the meridian at three quarters past one on the morning of the 1st, and at midnight on the 27th. His motion is retrograde through a degree and a quarter, being at the end of the month almost directly under the twenty-third of the Scorpion when on the meridian. At first, Antares is almost directly under him, and, by means of the twenty-third and twenty-fourth of the Scorpion, we shall always find him, as he is receding from the latter under the former star. The Moon passes him on the 23d.

The apparent diameter of the Sun on the 1st is thirty-one minutes fifty-seven seconds; and on the 20th, thirty-one minutes thirty-nine seconds. The apparent diameter of the Moon on the 4th at noon is half a degree, and it continues increasing to the 13th, when it is upwards of thirty-two minutes twenty-six seconds. It then decreases to the 29th, when it is twenty-nine minutes thirty-four seconds, increasing afterwards to the end of the month, closing with a magnitude of twenty-nine minutes fifty-four seconds.

The appearances of the fixed stars will be known by the description given of them in the volume for 1806, according to the following table of positions.

TABLE OF POSITIONS.

Pos.	1		8		16		24	
	h.	m.	h.	m.	h.	m.	h.	m.
IV.	9	7	8	40				
V.	10	58	10	31	10	0	9	28
VI.	0	54	0	27	11	56	11	24
VII.	2	54	2	27	1	56	1	24
VIII.	4	59	4	32	4	1	3	29
IX.					6	4	5	32

JUNE, 1815.

IN my observations last month on the small planets, I confined myself chiefly to the remotest of them, Ceres and Pallas, and considered the wonderful circumstances, that attend their nearness to each other. The case is very different with respect to Juno and Vesta, the two planets nearest to us. For there being a difference of three hundred and sixty-two days in the revolutions of Ceres and Vesta, their conjunctions will be, comparatively speaking, very frequent. According to the times specified for their revolutions by Bode, the time between each superior conjunction of Vesta will be only about twenty-one years and six weeks.

Also the times between two superior conjunctions of Juno to an inhabitant of Ceres, though much longer than that of Vesta, will still be short, when compared with that of Pallas. The difference between the times of revolution of

Ceres and Juno is ninety days, and the time between each two superior conjunctions is in consequence nearly eighty-one years and a half.

Hence the astronomers in Ceres, having such frequent opportunities of contemplating the increase and decrease of the splendour of Vesta and Juno, will naturally conjecture, that the same thing takes place with respect to Pallas, but only with a more lengthened duration. In fact, this duration will be discovered easily by those, who have the opportunity of seeing Pallas. For after a few revolutions the length of its year will be ascertained; and then, by an easy proposition, the length of the years of both planets having been ascertained, the time between their conjunctions is readily found.

The difference in the appearances of Pallas to Ceres and of Ceres to Pallas is very great. For Pallas, being an inferior planet to Ceres, is invisible at the inferior conjunction, whereas then Ceres will appear to Pallas as a full orb, and larger than any of the planets appear to us. Ceres does not, however, retain this fullness of orb, though it is the superior planet; for you will recollect, that Mars, though a superior planet to us, does at times appear to us gibbous. How much more, then, must the same cause operate upon Ceres, which, though a superior planet to Pallas, will, from the nearness of the orbits to each other, appear not only gibbous, but put on, also, many of the phases of the Moon.

This will be the case in a less degree with each superior of the small planets viewed from the inferior; and when the three planets, Ceres, Pallas, and Juno, are all seen nearly in opposition from Vesta, they will form a beautiful groupe, superior to any that is presented to us by our planets. If, at the same time, Jupiter, Saturn, and Herschell, should be near to the same point of the heavens, so glorious a scene could not fail of making a conspicuous figure in the annals of their astronomy. I leave you to calculate, when they were favoured with such an appearance; and when they are likely to have it renewed to them.

By what has been observed you will perceive, that our small planets are not to be despised for their diminutive size; and the favourable position, in which they are placed, may have given them a better knowledge of the system than even we inhabitants of a so much larger orb possess. In

Mars and Jupiter, they can study all that belongs to superior and inferior planets; and, if Mars does not appear to them so beautiful an evening or morning star as Venus does to us, yet the deficiency in his splendour is amply made up by the superior brightness at times of Jupiter. The appearances of the neighbouring orbs cannot fail of calling the attention of the inhabitants frequently to the heavens; and, if an astronomer were to choose his place in the system, he might select in the small orb of Vesta a spot not less favourable to his studies than either Greenwich, Paris, or Berlin.

To our Earth the discovery of these small planets may not be so important, yet to Mars and Jupiter they will offer much matter for observation. The state of Mars has been lamented from his being without a moon, and being at so great a distance from any planet; the four newly discovered planets must have been long known to his inhabitants, who found no difficulty in ranking them with the other planets. They are all superior planets to him, and must therefore frequently have adorned his heavens during a long night, giving him the opportunity of attending to their motions in a better manner than they can be known to our Earth. Who knows even whether, whilst we are denying to these bodies the names of planets, the inhabitants of Mars do not hold them of much greater consequence than even this Earth, which we inhabit. This may also be the case with the inhabitants of Jupiter: but lest this humiliation of our planet should put you too much out of conceit with yourself, let us proceed to consider what appearances our own heavens will present to us this month.

The Moon rises in the morning in the first week, as she becomes new on the 7th, at fifty-three minutes past three in the afternoon. Her southern latitude on the 2d, at noon, is five degrees and a quarter, in the seventh degree of the first sign, and it then decreases to its ascending node, which it arrives at on the 8th, between nine and ten at night, being then in the fifth degree of the fourth sign. On the 1st, she rises under Mars, at some distance from him to the east, and from him she recedes through the barren space under the four stars in Square, passing the line drawn through the two eastern of them and produced, just before she rises on the 2d. She rises on the 3d under the small stars in the band of the Fishes, which she passes about Sun-rise, and directs her course between the heads of the Ram and the Whale, but nearest to the small stars in the head of the latter, which she passes in the morning of the 5th, directing her course by the Hyades to her ascending node, between the twelfth and fifth of the Twins.

The crescent of the Moon reappears in the west-north-west in the evening of the 8th; but so near to the horizon, that she will be discerned by few observers. They who catch her by looking attentively may discern Mercury near to her, as she passes him early in the next morning, and he is now above her within three degrees. She now bends her course under the two first of the Twins, through the middle of the Lion, and the five stars in triangle of the Virgin, within which last she attains her greatest northern latitude; and on the 14th, at midnight, her latitude is five degrees sixteen minutes north, in the second degree of the seventh sign. On the 9th, we perceive her under the two first stars of the Twins and Venus, forming with them a very pleasing groupe, which is changed in the following evening by Venus being then below her. Her recess from this planet and approach to Jupiter, become now the chief features of her course. On the

11th, she is in the barren space between the Crab and the Lion; and on the 12th she is perceived to have passed since noon between the seventh and first of the Lion, the latter star being below her. Her course now lies through the body of the Lion, passing between the second of this constellation and the second of the Virgin in the afternoon; and in the evening of the 14th she will be seen above the latter star and Jupiter, passing the planet before she sets.

From the 14th the Moon takes a southern direction, bending to her descending node, at which she arrives between three and four in the morning of the 22d, passing it in the first degree of the tenth sign; and, as the full Moon takes place at six in the afternoon of the 21st, an eclipse may be expected. There is one, indeed, but invisible to us, as it ends at forty-nine minutes past seven afternoon, that is, before Sun-set. On the 15th, we perceive that she has passed through the five stars in triangle of the Virgin, and that her passage must have been between the third and fourth of this constellation, which stars are near to her to the west, the first being below her and at some distance to the east, and Jupiter at a greater distance below her to the west. She is now directing her course through the space between the two first stars of the Balance, by the second of the Scorpion, and on the 16th is on the meridian at nine minutes past eight in the evening, having now below her to the west the first of the Virgin, and at a considerable distance to the west Jupiter, Venus being in the lower region near west by north. Her appulse to the meridian is about forty-eight minutes later every evening till full Moon. On the 17th, when on the meridian, she has almost below her the first of the Balance, and she passes between the first and second stars in the course of the night. On the 18th, the second of the Scorpion is so near to her, that she will evidently pass it before her next appearance; and on the 19th it is seen to the west of her, Antares being almost directly below her, when she is on the meridian. She now pursues her course to the node through the barren space, north of the ecliptick, between the Scorpion and the Archer; and on the evening of full Moon on the 21st, we perceive her rising directly under the twelfth of the Archer, passing between the twelfth and eleventh of this constellation, as well as the node, before she sets.

On the 22d, the Moon rises under the small stars in the head of the Archer, being now to the east of them, and she is bending her course to the south of the ecliptick, attaining her greatest southern latitude on the 29th, which is at noon five degrees seventeen minutes, in the third degree of the first sign. In her course to this point she passes the planets Saturn and Mars; the former of whom we shall perceive at some distance from her on the 22d, on the other side of the two first stars of the Goat; Mars is at a considerable distance farther to the east. On the 23d, she rises under the two first stars of the Goat, still to the east of her, and is soon followed by Saturn, on the other side of those stars. On the 24th, she rises under the two first stars of the Goat, now to the west of her, and Saturn quickly follows her; and her approach to this planet, whom she will pass before her next appearance, is the chief feature of her course to-night. On the 25th, she rises between the small stars in the tail of the Goat, under Saturn, now to the west of her, and she is bending her course under Mars, who is seen soon after her, though at a considerable distance from her to the east. She travels now at a slow rate, going only twelve degrees in the twenty-four hours, so that she does not reach Mars till the 29th; and we may mark the slowness of her course by her progress under the four stars in triangle of the Urn and the four stars in Square. On the 28th, she rises under Mars, who is seen to the east of her; and, during the morning of the 29th, is seen to make such approaches to him, that she will evidently have passed him before her next appearance. This is evident on the next day, when she rises in the morning, and is now bending to her ascending node.

Mercury is an evening star, at his greatest elongation on the 25th, being too near the Sun to be seen in the former part of the month, and at his greatest elongation he is only twelve degrees above the horizon at Sun-set, in the west-north-west; and the Sun's power is so great at this time of the year, that he will be noticed only by the keen astronomer just before he reaches the horizon. The Moon passes him on the 9th.

Venus is an evening star, conspicuous at Sun-set; and, when the stars appear, she is first seen under the two first stars of the Twins, being between the second and the fourth. Her latitude, on the 1st, is two degrees four minutes north, in the eighteenth degree of the fourth sign; and this is daily diminishing till it becomes nearly one degree forty minutes. Her course is direct, through thirty-four degrees, towards the first of the Lion, though she falls short of him six degrees. She passes the tenth of the Twins on the 6th, the star being fifty-seven minutes from her to the north, and then directs her course by the nebula in the Crab, passing between the third and fourth of this constellation on the 17th. She now moves on through the barren space between the Crab and the Lion, finishing her course near to but to the west of the twenty-third of this latter constellation. The Moon passes her on the 10th.

Mars is a morning star at first, but he rises at midnight on the 26th. His motion is direct, through nineteen degrees, with an increasing southern latitude, at first two degrees eleven minutes, in the fourteenth degree of the twelfth sign, and finally becoming about three degrees. He is first seen in the stream of the Urn, passing under the twenty-first of the Water-bearer on the 3d, distance twenty-seven minutes Mars to the north. Hence his course is through the barren space under the four stars in Square, ending it in a line nearly with the two eastern of these stars. The Moon passes him on the 29th.

Ceres is an evening star, and is seen in a sufficiently advantageous position under the two first of the Twins and above Venus on the 1st. Her position may be easily discovered, as she is very near to the ninth of the Twins, having passed this star about two in the morning at the distance of only twenty-five minutes, the star being to the north of her. To the east of this star is a small one called 16, which she passes on the 2d, about seven in the evening, the star being to the north, at the distance of fifty-one minutes. On the 6th, she passes the twentieth of the Twins, this star being only ten minutes from and to the south of her. She now directs her course under the second of the Twins to the twenty-first of this constellation, which she passes on the 19th, the star being at six in the evening only fourteen minutes from her, and to the north of her. She directs her course to the thirteenth of the Crab; and, during the month, she passes with a direct motion through thirteen degrees, increasing from her first northern latitude of five degrees nineteen minutes, in the sixteenth degree of the fourth sign, to five degrees and three quarters. The Moon passes her on the 9th.

Jupiter is an evening star, being on the meridian at twenty-eight minutes past seven in the evening of the 1st, and every evening later. His motion is direct, through a degree and forty minutes, towards the seventh of the Virgin, the star near to but to the east of him. His latitude is at first one degree twenty-six minutes north, in the first degree of the seventh sign, and it does not decrease quite eight minutes. Soon after Sun-set the western hemisphere, adorned by the two planets Jupiter and Venus, will call our attention in our evening walks, and we shall daily observe the distance between them diminishing. The splendour of both will be injured by the light of the sky, but enough remains to make them striking objects to the common observer, and the curious observer will turn his glass from one to the other with great satisfaction. The Moon passes him on the 14th.

Saturn is on the meridian on the 1st, at nearly half-past four in the morning, and on the 18th at three. His motion is retrograde, through a little more than a degree; and his latitude, forty-one minutes south, in the thirteenth degree of the eleventh sign, increases to nearly forty-nine minutes. When on the meridian, he has above him the two first stars of the Goat to the west, and the four small stars in the tail to the east of him, but he is nearest to the latter stars. On the 1st, he rises a little before midnight, and every night earlier. The Moon passes him on the 25th.

Herschell is on the meridian at thirty-five minutes past eleven at night of the 1st, and at ten minutes past ten of the 21st. His motion is retrograde, through little more than a degree, in the space under the twenty-third and twenty-fourth of the Scorpion, his latitude being seven minutes north, at first in the fifth degree of the ninth sign. The Moon passes him on the 19th.

The apparent diameter of the Sun on the 6th is thirty-one minutes thirty-four seconds, and on the 26th thirty-one minutes thirty-one seconds. The apparent diameter of the Moon on the 3d, at midnight, is thirty-one minutes; and it increases to the 10th, when it is thirty-two minutes fifty-two seconds. It then decreases to the 25th, when it is at midnight twenty-nine minutes and a half, increasing afterwards to the end of the month, finishing with a magnitude of thirty minutes thirty-four seconds.

For the position of the fixed stars at any hour of the night consult the description of them in the volume for 1806, according to the following table:

TABLE OF POSITIONS.

Pos.	1		8		15		23	
	h.	m.	h.	m.	h.	m.	h.	m.
V.	8	55	8	26	7	57		
VI.	10	51	10	22	9	53	9	20
VII.	0	51	0	22	11	53	11	20
VIII.	2	56	2	27	1	58	1	25
IX.	4	59	4	30	4	1	3	28
X.			6	25	5	56	5	23

JULY, 1815.

IN a preceding volume, I recommended as an amusement the forming upon pasteboard circles to represent the paths of the planets, and by means of a thread, drawn through the center, to fix the position of each, as it would be viewed by a spectater from the Sun. By means of a thread drawn through the point where the Earth is placed, the position of each planet, as seen from the Earth, is determined. This has shown you, with sufficient accuracy, the nature of the motions of the Earth and six planets: but as there is such a peculiarity in the motions of the four newly discovered planets, they deserve to have a scheme particularly for themselves; and the tracing out of their paths, according to the knowledge we now have, may amuse you; and this will be brought to a greater degree of accuracy by future observations.

You remember, that, by the discovery of

Kepler, the proportion between the distances and the periodical times of the planets is very nearly ascertained; at any rate it is sufficient for our purpose, and the newly discovered planets will probably point out to us some deviations from this rule, that may give rise to future conjectures. From the times of the revolutions of these planets laid down by Bode, we may take the following proportion, as sufficiently near for our purpose; namely, the numbers eight hundred and forty-one, eight hundred and forty, seven hundred and ninety-five, six hundred and sixty; the greater number for Ceres, the next for Pallas, the third for Juno, and the last for Vesta.

You are now to find what is vulgarly called the squares of these numbers, or another set of numbers, made by the multiplication of each number by itself. This I will leave you to do by yourself, as there is no great difficulty or trouble in this operation.

The next operation is rather more difficult; for now you have to find what is called the cube root of each of the last numbers. This, however, will be done with no great trouble, as we do not want many figures. Four will be sufficient. But they who are acquainted with logarithms, (and I hope no small number of my readers can manage them as easily as common numbers,) will perform this operation with great ease, and will give the cube roots to be found, as far as seven places of figures.

The numbers thus found place in their order before the names of Ceres, Pallas, Juno, and Vesta, and divide each of the numbers belonging to the three last names, by the number belonging to Ceres. This will not be troublesome, as we want only three figures from each division; and now, affixing unity to Ceres, the numbers last found will give the proportions of the distances of the three latter planets. If, instead of unity, we suppose the distance of Ceres to be such, that its path may be represented by a circle, whose radius is ten inches, then the paths of the other planets will be represented by circles, whose radii are as many inches, as are denoted by the first figure on the left hand in the number last found, for the three planets, and the other figures represent the tenths and hundredth parts of an inch: and as I do not imagine that you have measures beyond the hundredth part of an inch, this will suit our purpose.

Having thus obtained every thing, that is necessary in numbers, you have nothing now to do, but to transfer the knowledge you have obtained to pasteboard. According to the size of your pasteboard, you will take a greater or less radius for the circle of Ceres. If you think ten inches sufficient, then the proportion last found will do. If you take twelve, fourteen, fifteen inches for the radius of Ceres, then the numbers first found for the proportions of the distances must be multiplied by twelve, fourteen, or fifteen; and thus, taking for each planet a radius in inches and parts of an inch suited to its proportion, you will draw on your pasteboard four circles, to represent the paths of these planets. The path of Ceres may be divided into thirty-six parts, each part representing ten degrees; and one part may be divided into ten parts, to give the degree of your outer circle.

As the time of revolution of each planet is so long, the daily motion in the orbit will be small, and it will be sufficient for our purpose to find the motion in each ten days; and this is done with great ease, by means of the proportion first laid down of the periodical times. Divide, therefore, the number eighteen hundred by each of the numbers eight hundred and forty one, eight hundred and forty, seven hundred and ninety-five, six hundred and sixty, and the result will give you the motion of each of the planets Ceres, Pallas, Juno, Vesta, in ten days, in degrees and parts of degrees. If necessary, by dividing these last numbers by ten, you have the daily motion of each of the planets.

With the pasteboard thus prepared, and a small circle of card to be placed as occasion may require on the place of either of the planets, to ascertain the positions of the others as seen from it, you are qualified to judge experimentally of what has been said of their relative positions to each other; and, leaving you to perform your task with as much accuracy as you can, I proceed to my monthly observations.

The Moon rises in the morning of the 1st, and is seen to direct its course through the barren space west of the heads of the Ram and the Whale, and she is now bending towards the ecliptick, as her latitude at noon is four degrees fifty-one minutes south, in the twenty-eighth degree of the first sign; and she is proceeding to her ascending node, which she passes on the 6th, between seven and eight in the morning, being then in the fourth degree of the fourth sign. In the morning of the 2d, she is seen between the three first stars in the head of the Ram and the small stars in the head of the Whale, and near to the latter stars, but she does not pass the line between the first stars of the Ram and Whale before Sun-rise. On the 3d, she is between the first of the Whale and the Pleiades. On the 4th, she is seen under the Pleiades, but she does not reach the Hyades before Sun-rise, as she passes the fifth soon after nine in the morning. Consequently, on the 5th, Aldebaran with the Hyades will be seen at some distance above her; and on the 6th, there is an eclipse of the Sun, not visible in this country, as it takes place whilst the Moon is under our horizon, and the Sun is centrally eclipsed on the meridian at thirty-seven minutes past eleven at night, in longitude a hundred and seventy-four degrees twenty-four minutes west, and latitude eighty-eight degrees three minutes north. The Parisians differ from us in this calculation, as they make the latitude to be eighty-seven degrees forty-three minutes, and the longitude to be a hundred and seventy-six degrees thirty-eight minutes.

On the 8th, the crescent of the Moon reappears in the west in the barren space between the Crab and the Lion, directing her course through the space between the first and seventh of the latter constellation, near to which is Venus, and beyond her Jupiter The passage therefore of the Moon by these planets will amuse our evening walks, and as the motion of the Moon is now rapid, she will approach near to Venus at her next appearance. She is now increasing her northern latitude, which becomes greatest on the 12th, being at noon of that day five degrees sixteen minutes, the Moon being then in the sixth degree of the seventh sign. On the 9th, she is seen near to the seventh of the Lion, as she passes this star about seven in the evening. Under her to the east is the first of the Lion, and beyond it eastward Venus, and this groupe will fix our attention. On the 10th, Venus is seen below the Moon, and at some distance from her to the west, Jupiter being still farther from her to the east; and on the 11th she has advanced so near to Jupiter, that she will evidently have passed him before her next appearance. On the 12th, she is seen at some distance from Jupiter to the east, having passed through the five stars in triangle of the Virgin, the third of this constellation being near to her but below her. On the 13th, she is declining towards the ecliptick to her descending node, which she reaches on the 19th, between eight and nine in the morning, in the third degree of the tenth sign. From her great latitude on the 13th, she passes the first of the Virgin at a considerable distance, and directs her course through the space between the two first stars of the Balance. The western hemisphere, adorned with the first of the Lion, Venus, Jupiter, the first of the Virgin, and the Moon, thus presents a very agreeable groupe to our view.

On the 15th, the Moon is on the meridian at thirty-six minutes past seven in the evening, and about fifty minutes later for some successive nights. Directly above her is the second of the Balance, and to the east the third, under which she passes about Moon-set; and on the 16th, when she is on the meridian, we perceive near to her on the west the second of the Scorpion, as she passes the thirteenth at forty-six minutes past eight in the evening, the star being sixty-seven minutes from her to the south. On the 17th. Antares is seen at some distance from her to the west, and she passes the eighth of the Serpent-bearer before Moon-set. On the 18th, she has at first the twelfth and eleventh of the Archer to the east of her, evidently to pass between them soon after Moon-set. On the 19th, she is among the small stars in the head of the Archer, the two first stars of the Goat and Saturn being at a considerable distance from her to the east.

From the 19th the Moon takes a southern direction, and her southern latitude increases to the 26th, when it is at midnight five degrees twelve minutes, in the fifth degree of the first sign. This carries her at some distance under the two first stars of the Goat on the 21st, in the morning of which it is full Moon, at thirty-three minutes past eight; and at night she rises under the two first stars, being soon after followed by Saturn. She passes the planet before noon of the 22d, and is consequently seen to rise under him in the evening, being soon followed by the small stars in the tail of the Goat, which she passes before Moon-set. Her passage is through a dreary region on the 23d and 24th, being at a considerable distance under the four stars in triangle of the Water-urn; and on the 25th, she is in a still more barren space, under the four stars in Square. On the 26th, she rises almost in a line with the two eastern of the four stars in Square, but from her great southern latitude she is at a great distance from them; and as she rises in the heaven, we shall perceive Mars to the east of her, by whom she is directing her course.

On the 27th, the Moon's southern latitude is decreasing, and continues to do so till she arrives at her ascending node, which she reaches on the 2d of next mouth, it being placed in the fourth degree of the fourth sign. She rises under the four stars in Square, to the east of the line drawn through the highest and lowest of these stars and produced. Mars is near to and to the east of her, and her passage by and under the planet will amuse the traveller during the night. On the 28th, she rises under Mars, having the three first stars of the Ram above her during the night. On the 29th, she is seen to have passed through the space between the three first stars of the Ram and the small stars in the head of the Whale. On the 30th, she rises nearly under the Pleiades near midnight; and, during the morning of the 31st, is seen to be directing her course between these stars and the Hyades, but nearest to the latter stars.

Mercury is an evening star during the former part of the month, and in his inferior conjunction on the 22d. On the 1st, his height above the horizon at Sun-set is about ten degrees, near west-north-west, and this height is continually decreasing, and the opportunities of seeing him of course diminishing. He is on this day under the small stars and nebula in the Crab, moving from them with a retrograde motion, and his latitude south is increasing. The Moon passes him on the 8th.

Venus is an evening star, to be discovered in the heavens before Sun-set, in the upper part of the lower region, to the south of west. Her brilliancy is considerable, more than half of her orb being illumined by the Sun, and the diameter of it is seventeen seconds; but as this diameter is increasing, though the illumined part is decreasing, her brightness is inferior to what it will be next month. Her motion is direct through thirty-two degrees; and her latitude, at first one degree forty minutes north, in the twenty-second degree of the fifth sign, is decreasing, as she passes her ascending node on the 27th, in the nineteenth degree of the sixth sign. She is seen at first under the first of the Lion, which star she passes on the seventh in the evening, at the distance of fifty-seven minutes, the star being to the south of her. Hence she directs her course to the seventeenth of this constellation, passing it on the 12th, at night, the star being fifty-six minutes distant from and to the south of her. On the 20th, in the afternoon, she passes the twenty-second, to the south of it, at the distance of forty-seven minutes; and on the 27th, the nineteenth, in the morning, at the distance of thirty-four minutes, the star being to the south. She is directing her course under the second of the Virgin, but does not pass the star this month. During her course, we shall notice her daily progress towards Jupiter, whom she will pass next month; and the presence of these beautiful planets above the horizon cannot fail of being noticed in our evening walks. The Moon passes Venus on the 10th.

Mars is a morning star, being on the meridian at half-past five on the morning of the 1st, and at five on the 20th. His motion is direct, through seventeen degrees, being at first in the third degree of the first sign, with a latitude of three degrees south, which increases to upwards of three degrees and a half. He rises under the four stars in Square, to the east of the line drawn through the two eastern stars, and his progress is through a barren space to the band of the Fishes, of which he passes under the sixth on the 27th. Under this star is a small one called *f*, which he passes about eleven before noon, at the distance of forty-four minutes, and to the north of it. The Moon passes him on the 28th.

Ceres is an evening star, her duration being at first above an hour and three quarters above the horizon after Sun-set. This is owing to her great northern latitude, which, on the 1st, is five degrees and three quarters north, in the last degree of the fourth sign, and this latitude increases to six degrees and a quarter. Her motion is direct, through thirteen degrees and a half. At first she is seen under the thirteenth of the Crab, and this star she passes in the morning of the 6th, at the distance of fifty minutes, the planet being north; and thence she directs her course to the first fourteenth of this constellation, which she passes in the morning of the 26th, the star being three quarters of a degree from her and to the south. She is directing her course under the small stars in the head of the Lion, and will be lost sight of soon after the middle of the month. The Moon passes her on the 8th.

Jupiter is an evening star, being on the meridian on the 1st at half-past five afternoon, and every day later. His motion is direct, through four degrees, and his northern latitude, at first seventy-eight minutes, in the second degree of the seventh sign, decreases to seventy-three minutes. We see him at first under the seventh of the Virgin, and he passes this star on the 4th, about noon, at the distance of only five minutes to the south of it. From this star he recedes evidently in a direction to pass under the third next month, but at a much greater distance. The Moon passes him on the 12th.

Saturn is on the meridian at two in the morning on the 5th, and at half an hour before one on the 26th. His motion is retrograde, through two degrees; and his latitude, at first three quarters of a degree south, in the twelfth degree of the eleventh sign, increases to forty-nine minutes. He is situated nearly midway between the two first stars in the Goat and the small ones in the tail, in a barren region, in which his passage by the star 21, will be noticed, as he passes it on the 19th, at the distance of seventeen minutes, the star being north. The Moon passes him on the 22d.

Herschell is on the meridian at twenty-seven minutes past nine at night on the 1st, and at three minutes past eight on the 21st. His motion is retrograde, through nearly forty minutes. His latitude, six minutes north, in the fourth degree of the ninth sign, varies very little during the whole month. When on the meridian the twenty-third of the Scorpion is near to and above him to the east, and the second at a rather greater distance to the west of him. The Moon passes him on the 16th.

The apparent diameter of the Sun on the 1st is thirty-one minutes thirty-one seconds, and on the 18th, thirty-one minutes thirty-two seconds. The Moon's apparent diameter is at midnight of the 1st thirty-one minutes two seconds; and it increases to the 8th, when it is at noon thirty-three minutes eighteen seconds: it then decreases to the 23d, to less than twenty-nine minutes twenty-eight seconds, and afterwards increases to the end of the month, finishing with a magnitude of thirty-one minutes fifty-eight seconds.

For the appearances of the fixed stars during this month, consult the description of the positions in the volume for 1806, according to the following table.

TABLE OF POSITIONS.

Pos.	1		8		16		25	
	h.	m.	h.	m.	h.	m.	h.	m.
VI.	8	47	8	18	7	46	7	10
VII.	10	47	10	18	9	46	9	10
VIII.	0	52	0	23	11	51	11	15
IX.	2	55	2	26	1	54	1	18
X.	4	50	4	21	3	49	5	13
XI.			6	22	5	50	5	14

AUGUST, 1815.

IN preparing the scheme for the four newly discovered planets, you made the outward circle to represent the path of Ceres, as also the ecliptick, if we may so call it, of that planet. The motions of the other planets are necessarily, therefore, referred to this circle; and we can contemplate with such a sheet of pasteboard motions only in the same plane. We are to make due allowances for the situations of each planet above this plane, as in this respect they differ so materially from the other planets; but, as far as the conjunctions, elongations, and stationary points and degrees of brightness of each planet are to be considered, this scheme will very well answer the purpose.

For each planet, it will be useful to have a small piece punched out of card to represent it; and this piece, being circular, may be divided into two by a diameter, one half being left white and the other coloured, four colours being used on this occasion for the different planets. The coloured will represent the dark part, the white the part of the planet's disc enlightened by the Sun. Consequently, in placing any planet on its circle, a little care is necessary, that the white part should be towards the center of the pasteboard, in such a manner, that the thread drawn from the center to the planet shall be at right angles to the diameter. Thus the coloured part will be without the circle, and the white part within, as nearly as a straight line can coincide with the circular arc.

Thus by drawing the thread of any one planet to another, you will easily perceive how much of the illuminated disc of the latter planet is seen by the inhabitant of the former. You will recollect, also, that the brightness of the planet does not depend merely on the quantity of the illuminated part seen by the observer; his distance must be taken into consideration; and this has given rise to a very pretty problem, respecting the Earth and Venus, which, when transferred to Ceres and Pallas, may become much more interesting to the mathematician.

It may be amusing to trace the motions of only two planets at first, beginning with Ceres and Vesta, the planets moving in the outermost and innermost circles. Let them both be supposed to be, when viewed from the Sun, in the first degree of the first sign, and consequently Vesta is in her inferior conjunction. Let each of them be moved in her circle a number of degrees equivalent to what the planet would pass over in thirty days, which is readily found by the proportions before laid down; and at each stop let the thread be drawn from planet to planet, to point out how the illumined disc varies to each, and also let the small circles be applied to each, to show how the longitudes vary as seen from each other. Thus the time elapsing between the inferior and superior conjunctions will be nearly found, and it may afterwards be pointed out with greater accuracy.

Having done this with Ceres and Vesta, you may go through the same process with Ceres and Juno, and afterwards with Ceres and Pallas. In the latter case, however, instead of taking the motion of thirty days, it will be better to have that of thirty hundred days, and you will then see how small the change is in that space of time in the appearance of the inferior planet. Even with this interval of time allowed for your operations, your solar thread will make many revolutions before you get from the inferior to the superior conjunction.

From thus having tried the powers of our pasteboard scheme in a few cases, you may try all the planets together, placing them in a direct line with the Sun, so that they shall all appear to an observer in the Sun to be in the first degree of the first sign. Let them now be moved, each in its orbit, as far as the planet goes from the Sun in ten days. You will then perceive how great the changes of the two innermost planets are, compared with those of the outer. You may also form some conjecture when they will all occupy the same place again in the heavens; but I should recommend to you to discover it by the arithmetical process, rather than by a tedious number of revolutions, which will probably discourage you before you come to the end of your trial. I may hereafter be able to point out to you the actual places which each occupies in the heavens, together with a more accurate proportion of the times and distances, should these subjects be laboured, as I hope they will be, in the observatories of Greenwich and Paris. At present, Germany has carried the palm before England and France; but much remains to be done; and it may be some years before the paths of the four newly discovered planets are as well laid down as those of the old ones. From the number of labourers in different parts of Europe, it cannot be doubted, that the problem will be well performed; and, if it should not coincide with more accurate observations in the heavens, the causes of the aberrations will be attended to. You will recollect, that to Kepler's researches on Mars we are indebted for his great discovery; and these little planets may produce something of as great importance. But I leave these conjectures, and proceed to the appearances in the heavens during this month.

The Moon is new on the 5th of this month, at fifty-seven minutes past six in the morning, having a northern latitude of three degrees; and this continually increases to the 8th, when it is at noon five degrees nine minutes, in the first degree of the seventh sign; it then decreases till the Moon arrives at her descending node on the 15th, between eleven and twelve in the morning, her place being then in the third degree of the tenth sign. The crescent of the new Moon appears in the west, on the evening of the 7th, near the small stars in the head of the Virgin, as she passes the thirteenth of this constellation soon after Moon-set. Under her is Venus, near the second of the Virgin, and at some distance to the east Jupiter; and this groupe will form a pleasing object in the lower region in the west. On the 8th, we see the Moon above the seventh of the Virgin and Jupiter, but she does not pass the planet till after Moon-set, and the variation of the groupe of the preceding day will strike the observer. On the 9th, the five stars in triangle of the Virgin, with Jupiter and Venus, are at some distance to the west of the Moon, and the first of the constellation is considerably below her. On the 10th, she is seen to have travelled considerably from the objects of the preceding evening, and to be directing her course through the space between the two first stars of the Balance. This she passes through in the afternoon of the 15th, so that at the appearance of these stars she will be seen to the east of the line connecting them. On the 12th, we see her above the second of the Scorpion, which she passes about Moon-set; and on the 13th, she is on the meridian at twelve minutes past seven in the evening, having Antares at some distance below her to the west.

On the 14th, the Moon is on the meridian at two minutes past eight in the evening, having to the east of her the eleventh and twelfth of the Archer. Jupiter and Venus are now near each other and the horizon in the west. On the 15th, she is on the meridian at fifty-two minutes past eight, and every evening later by about fifty minutes, till full Moon. As she passes the node today about noon under the twelfth of the Archer, this star will be seen to the west of her at its appearance; and when on the meridian she will be seen midway between this star and the small stars in the head of the Archer. Under these she directs her course, and her southern latitude daily increases till the 22d, when it is at midnight five degrees four minutes in the second degree of the first sign. She then bends back to the ecliptick, which she passes in her ascending node at midnight on the 29th, her place then being in the second degree of the fourth sign.

On the 16th, we perceive the small stars in the head of the Archer to the west of the Moon, and to the east of her Saturn, the two first stars of the Goat being above them about midway. On the 17th, she is seen in a line with the two first stars of the Goat, as she passes it during the night, and is almost directly under them when on the meridian. It is evident, that she will have passed Saturn before her next appearance. On the 18th, when on the meridian, we perceive to the east of her the small stars in the tail of the Goat, and to the west, at somewhat greater distance, Saturn. She rises on the 19th under these stars; and at eleven minutes past midnight is full Moon, but, from her great southern latitude, without an eclipse. She now pursues her course at a great distance under the four stars in triangle of the Water-urn and the four stars in Square; and on the 23d her southern latitude decreases, as she bends to her ascending node, which she arrives at on the 29th, a little before midnight, it being placed in the second degree of the fourth sign.

On the 23d, the Moon rises under the four stars in Square, not having reached the line drawn through the highest and lowest of these stars: she is directing her course through the space between the three stars of the Ram and the small stars in the head of the Whale, and by the Hyades, to the seventh and twelfth of the Twins. In her course she passes, between two and three in the morning of the 26th, the twelfth of the

Whale, the star being one degree thirty-three minutes from and to the south of her; and on the 28th, near four in the morning, the fifth of the Bull, the star being twenty-two minutes from and to the south of her. She will rise, therefore, on the 27th, under the Pleiades, followed by this star, and to the west of the Hyades. She rises in the morning of the 30th and 31st, and on the former of these days passes the twelfth of the Twins about three o'clock, the star being fifty-five minutes from and to the south of her, directing her course under the fifth; and on the morning of the 31st, she rises soon after the two first of the Twins, and passes them before her next appearance in the following month.

Mercury is a morning star, during the whole month, and at its greatest elongation on the 10th, when he is at Sun-rise about twelve degrees above the horizon. At first he is under the two first stars of the Twins, and to the west of the sixth of the Crab, towards which latter star he is directing his course; as he passes it on the 11th, and his ascending node on the 1[illegible], about a degree to the east of the fourth of this constellation. The Moon passes him on the 4th.

Venus is an evening-star, at her greatest elongation on the 1st, and appearing on the 2d as a half Moon, her apparent diameter being twenty-three seconds. Her latitude on the 1st is thirty-one minutes south, in the twenty-fifth degree of the sixth sign, and this increases to four degrees and twenty-five minutes. Her motion is direct, through twenty-six degrees, and we see her on the 1st, near to the second of the Virgin, as she passed this star in the day time. She is directing her course under the five stars in triangle of the Virgin towards Jupiter, whom she passes on the 17th, the distance between them being three degrees and a half, and Venus to the south. Hence she directs her course very obliquely under the first of the Virgin, which star she does not pass till next month. From the unfavourableness of her position, she will, at Sun-set, on the day of her passage by Jupiter, be only about eight degrees above the horizon in west-south-west; but her brilliancy and that of Jupiter will not permit the phœnomenon to pass unnoticed by the commonest observer. The Moon passes her on the 8th.

Mars rises about ten o'clock at night on the 1st, and every night later. His motion is direct through ten degrees, and his latitude, at first three degrees thirty-nine minutes south, in the twentieth degree of the first sign, increases to three degrees fifty-eight minutes. His course lies through part of the bands of the Fishes and barren space under the three first stars of the Ram. The twelfth of the Fishes he passes about noon of the 3d, at the distance of thirty-six minutes, the star being to the north of him; and on the 9th, about midnight, the thirteenth, the star being to the south of him, and distant sixty-four minutes. The Moon passes him on the 25th.

Ceres eludes our researches this month, as she is in conjunction with the Sun on the 11th, Her motion is direct, through nearly sixteen degrees. Her latitude, at first, is six degrees sixteen minutes north, in the fourteenth degree of the fifth sign, and it increases to six degrees fifty minutes.

Jupiter is an evening star, being on the meridian at forty minutes past three in the afternoon of the 1st, and every day later. We see him soon after Sun-set in the lower region in west-south-west; and Venus, to the west of him, gives great lustre to that part of the hemisphere. His motion is direct, through five degrees and a half; and his latitude, at first one degree twelve minutes north, in the sixth degree of the seventh sign, decreases to one degree nine minutes. His course is directed under the third of the Virgin, which star he passes in the afternoon of the 11th, the star being north of him, at the distance of one degree thirty-eight minutes. His superiority over the first of the Virgin, to the east of him, will be manifest, as will his inferiority to Venus, during the passage of the latter by him. The Moon passes him on the 8th.

Saturn is on the meridian about midnight of the 1st, and at three quarters past ten of the 20th. His motion is retrograde, through somewhat more than two degrees; and his latitude, at first forty-nine minutes south, in the tenth degree of the eleventh sign, is increased by scarcely a minute. From nearly the middle space between the two first stars of the Goat and the stars in the tail, he slowly moves towards the former stars, and he is in a favourable position for evening observations towards the end of the month. The Moon passes him on the 18th.

Herschell is on the meridian at twenty minutes past seven in the evening of the 1st, and at six on the 22d. He is stationary on the 11th, and of course, during the month, his motion is very slow. His latitude, at first six minutes north, in the third degree of the ninth sign, scarcely decreases a minute. Our chief direction now to him is the second of the Scorpion, which will be to the west, and the twenty-third to the east of the meridian, when he is upon it. The Moon passes him on the 13th.

The apparent diameter of the Sun on the 1st, is thirty-one minutes thirty-five seconds, and on the 21st thirty-one minutes forty seconds. The apparent diameter of the Moon, at midnight on the 1st, is thirty-two minutes twenty-eight seconds, increasing to the 5th, when it becomes thirty-three minutes twenty-eight seconds. It then diminishes to the 19th, when it is twenty-nine minutes twenty-six seconds, increasing afterwards to the end of the month, when it is at midnight thirty-three minutes six seconds.

For the appearances of the fixed stars at any hour of the night, consult the positions described in the volume for 1806, according to the following table.

TABLE OF POSITIONS.

Pos.	1		8		16		25	
	h.	m.	h.	m.	h.	m.	h.	m.
VII.	8	42	8	15	7	45	7	12
VIII.	10	47	10	20	9	50	9	17
IX.	0	50	0	23	11	53	11	20
X.	2	45	2	18	1	48	1	15
XI.	4	46	4	19	3	49	3	16
XII.					5	55	5	22

SEPTEMBER, 1815.

IN performing the little exercises I have proposed to you, with respect to the newly discovered planets, it has not escaped you what great changes will be made in their appearances, as seen from one another, compared with what occurs in the old planets. Hence you will be led to consider what varieties there may be in the systems of Providence, and how much is left to be discovered by future ages. No one can say what is the limit of the inclinations of the planets to the plane of the Earth's orbit; for, as four planets have been discovered between Mars and Jupiter, there may be many more between Jupiter and Saturn, and the inclination of the orbits of some one such, that, at times, it should pass through the pole of our ecliptick. Nay, who can say positively, that there may not be an orb bigger than either of the newly discovered planets between the Earth and Venus, or the Earth and Mars, which has remained hitherto undiscovered, by former, and in fact undiscoverable at present, by even the improved art of modern astronomers.

I leave you to determine this question for yourself, putting the case, that a planet does exist at the distance nearly of the Earth from the Sun, and that its year consists of three hundred and sixty-five days five hours and a half. At the deluge, it may be supposed to be at an elongation of twenty-degrees from the Sun, and moving to its inferior conjunction. At what time would the inhabitants of the Earth be sensible of the existence of their neighbour, so as to speak positively on its annual revolutions, and to determine its future places in the heavens with accuracy? If any one should say, it is not probable that two planets should exist so near each other, we can refer them only to our newly discovered planets, and reply, in addition, that our knowledge is far too limited for us to determine what is the probability of an event, on which we have no reasonable data to go upon. Our knowledge has been extended by the late discoveries; and we are now convinced of the existence of small bodies in spaces hitherto supposed unoccupied. We may infer, therefore, that it is not improbable, that the great expanse of heaven above and below the plane of our orbit, has numerous similar bodies revolving round the Sun.

We have supposed the existence of a body revolving round the Earth in an orbit of nearly the same dimensions, and it may be amusing to contemplate the differences that would take place in the appearance of such an orb, according to the inclination of its orbit to ours. This may be very different, and the extreme case is that of the plane being upright, or such that the orb should pass through the pole of the ecliptick. Now, then, what will be the case, supposing, at the deluge, its elongation from the Sun to have been twenty degrees, and that it was moving to its inferior conjunction. Here you will perceive that something more is requisite for you to determine the question, and you will ask for the position of its node. We will suppose, then, that it was twenty degrees from the descending node, placed in the autumnal equinox, the Earth being placed at the time in that equinox; and you may afterward place the node in different situations.

This consideration of the place of the node, brings to our mind a phœnomenon of a very peculiar nature, that might take place in our Earth upon the former positions, and that may take place in the revolution of ages in the newly discovered planets. Supposing the orb that we have imagined to be near the Earth to revolve in such a manner that its inferior conjunction should take place in its node. It would of course pass the Sun as a spot upon its disc, or, if its magnitude were considerable, it would cover the disc entirely, and thus keep the Sun in eclipse for several years. If such an event is imagined to occur, it would take many many years before it occurred again; for the question is not now how long it is between conjunction and conjunction, but how long between conjunction in one spot and conjunction again in the same spot. This I leave to your calculations.

The disc of the Sun at Ceres appears much smaller than to us; and at the same time Pallas is much smaller than the Earth, it being computed to be thirty-seven times less than the Earth. Now, on the supposition that a conjunction takes place near the node, the interposition of Pallas between the Sun and Ceres may deprive the inhabitants of a considerable portion of heat and light; of how much I leave you to consider. But the transit of Pallas over the disc of the Sun will often be very different from that of Mercury and Venus to us; and, when the conjunction is central, the difference will be very great. This is the first point for your consideration, and you may then determine how long the eclipse will last.

But in your contemplation of these newly discovered bodies, another case will suggest itself to your mind. We have supposed Pallas to be the inferior planet to Ceres; but it is possible that this is not the case, for they may change their situations, and the one, which was inferior at one time, may become superior at another. This will form a very novel distinction in the account of our planetary system. The point is this: supposing the periodical times such as we have laid down for these two bodies, it is evident, that, if they revolved in circles in the same plane, they would pass near to each other at every conjunction; or, whatever the inclination of their orbits may be, still, if the conjunction takes place in or near the node, they will be near to each other. But the planetary bodies remove in ellipses, not in circles; and, consequently, the eccentricity of their orbits is to be taken into consideration. If the sum of their eccentricities is greater than the difference between their mean distances, then the circumstance I have mentioned will take place; namely, they will vary their relation to each other; and Ceres, which was superior, will become an inferior planet, though its mean distance is greater than the mean distance of Pallas.

To make this clear to you, let us suppose that the eccentricity of the orbits is the same, and that, at the conjunction, Ceres is in her perihelion, or nearest to the Sun, and Pallas in her aphelion, or greatest distance from the Sun. Consequently, the distance of Ceres from the Sun is equal to her mean distance diminished by her eccentricity; and the distance of Pallas from the Sun is equal to her mean distance increased by her eccentricity. To make Ceres an inferior planet, that distance must be less than that of Pallas, which cannot be the case unless the eccentricity is greater than half the difference between the mean distances. This I leave to your consideration, and proceed now to the contemplation of the appearances in the heavens during this month.

The latitude of the Moon on the 1st, at noon, is three degrees one minute and a half north, in the ninth degree of the fifth sign; and it increases to the 4th, when it is at midnight five degrees two minutes, in the second degree of the seventh sign. It then decreases, till she arrives at her descending node, which she passes on the 11th, between two and three in the afternoon, it being placed in the first degree of the ninth sign. The new Moon takes place on the 3d, at twenty-one minutes past two in the afternoon, but, from her great latitude, without an eclipse. The crescent of the Moon is seen in the evening of the 6th, to the west of the tenth and eleventh of the Virgin, which she will have passed before her next appearance, and above the first. Venus is below this latter star, but so near to the horizon, that she will be seen but for a very short time after Sun-set; and Jupiter, though nearer to the Sun, will be longer visible. On the 7th, the Moon is seen between the eleventh and twelfth of the Virgin, and the two first of the Balance, between which latter stars she will have passed before her next appearance. On the 8th, she is seen near the seventh of the Balance, as she passes this star about seven in the evening. On the 9th, she is above the two first stars of the Scorpion, Antares being almost directly below her at some distance, and she is directing her course to the small stars in the head of the Archer. On the 10th, she is on the meridian at four minutes past six in the evening, having under her the eighth of the Waterbearer to the west; and on the 11th on the meridian at fifty-six minutes past six, being then between the eleventh and twelfth of the Archer, the former below to the east, the latter above and to the west. To the east of her we notice Saturn, at a considerable distance.

On the 12th, the Moon is on the meridian at forty-seven minutes past seven, the small stars in the head of the Archer being near to and to the west of her. On the 13th, she is on the meridian at thirty-six minutes past eight, the two first stars of the Goat being above her, and Saturn so near, that she will have passed him before her next appearance. Her southern latitude continues to increase till the 18th, when it is at midnight four degrees fifty-nine minutes, in the twenty-ninth degree of the twelfth sign. On the 14th, she is on the meridian at twenty-five minutes past nine, Saturn being near to her and to the west of the meridian. Every night to full Moon she comes later to the meridian by about three quarters of an hour. On the

15th, the small stars in the tail of the Goat are seen very near to and to the west of her. On the 16th, when on the meridian, she is directly under the four small stars in triangle of the Water-urn. On the 17th, she is under, when on the meridian, the four stars in Square, the two western on the western, and the two eastern on the eastern side of it; and on the 18th, is full Moon, at fourteen minutes past four in the afternoon, but, from her great latitude, without an eclipse.

On the 19th, the Moon bends her course to the ecliptick to her ascending node, which she passes on the 20th, between one and two in the morning, in the twenty-ninth degree of the third sign. She rises in the evening of the 19th, under the four stars in Square, and is soon followed by Mars, considerably to the east of her. On the 20th, Mars rises with her, though she has some distance to go before she reaches him; but it is evident that she will have passed him before her next appearance. On the 21st, she rises under the three first stars of the Ram, Mars being near her to the west, as she passed him about two in the afternoon, at the distance of a degree and a quarter, Mars being north; and on the 22d, she is seen to have receded considerably from him. On the 23d, she rises under the Pleiades; and on the 24th with the Hyades, but to the west of them, as she passes the tenth of the Bull at nineteen minutes past eleven. On the 25th, she is seen to have passed through the space between the tips of the Bull's horns; and on the 26th, she rises under the fifth of the Twins, at some distance from the seventh and twelfth, as she passed the seventh, at the distance of sixty-six minutes, about seven in the morning.

From the 26th, the northern latitude of the Moon increases to the 1st of next month, when it is at midnight five degrees, in the twenty-fifth degree of the sixth sign. On the 27th, she rises under the two first stars of the Twins, passing the second twelfth of the Crab at near four in the morning of the 28th, at the distance of one degree two minutes, the star being to the south. On the 29th, she rises in the morning under the small stars and nebula of the Crab, traversing the barren space between this constellation and the Lion; and on the 30th, she rises under and near to the seventh of the Lion, having passed this star about two hours and a half before. Consequently, she will soon be followed by the first of the Lion.

Mercury is in his superior conjunction on the 4th, and consequently cannot be visible in the former part of the month; and in the latter part, when he is an evening star, he is in such an unfavourable position, and with a southern latitude, that he will be under the horizon before the brightness of the sky is sufficiently diminished for his appearance. On the 28th, he passes the first of the Virgin, at the distance of a degree and twenty-five minutes, the star being south of him. The Moon passes him on the 3d.

Venus is an evening star, but, from her unfavourable position and great southern latitude, visible only for a short time, in the former part of the month, near the horizon, after Sun-set, in the west-south-west, under the first of the Virgin. Her motion is direct, through little more than six degrees, to the 22d, when she is stationary; and her latitude, at first four degrees twenty-six minutes south, in the twentieth degree of the seventh sign, increases to nearly eight degrees. Her apparent diameter is thirty-four seconds;

and her appearance, through a telescope, that of the Moon about five days old. The Moon passes her on the 6th.

Mars is on the meridian at a quarter past three in the morning of the 2d, and at three quarters past one on the 26th. He rises at first about a quarter past eight in the evening, near east by north, and every day earlier. His motion is direct, through nearly a degree, to the 13th, when he is stationary, and afterwards retrograde, through about two degrees and a quarter. His latitude, at first, is three degrees fifty-eight minutes, in the last degree of the first sign, and it decreases about half a degree. He rises under the two smaller of the three stars of the Ram, in the barren space, just above the head of the Whale, which will be made interesting by his splendour. The Moon passes him on the 21st, at three minutes past two in the afternoon, at the distance of only a degree and a quarter, Mars being to the north.

Ceres is a morning star, and, from the unfavourableness of her position and great northern latitude, may be discovered on the 1st of the month. Her motion is direct, through thirteen degrees and a half; and her latitude, at first six degrees fifty-one minutes north, in the twenty-eighth degree of the fifth sign, increases to seven degrees and a half. She is seen at first below the third of the Lion, and within two degrees of him, and is directing her course to a small star, marked 50, in the Lion, which she passes about six in the evening of the 12th, at the distance of only two minutes, the star being south of her; and she then directs her course above the star called *k*, which she passes on the 18th; and she ends her course under the eighth, in a line nearly with the fourth and eighth of the Lion.

Jupiter is an evening star, visible for a short time after Sun-set in west by south, in the early part of the month. He is nearer to the Sun than Venus, by nearly nine degrees; but his northern latitude gives him a much longer duration above the horizon after Sun-set. His motion is direct, through nearly six degrees and a quarter; and his latitude, at first one degree eight minutes north, in the twelfth degree of the seventh sign, is diminished only by about two minutes. To the west of him are the five stars in triangle of the Virgin, and he is nearest to the third. The Moon passes him on the 6th.

Saturn is on the meridian at fifty-seven minutes past nine at night of the 1st, and half-past eight of the 24th. His motion is retrograde, through nearly seventy minutes; and his latitude, at first fifty minutes south, in the seventh degree of the tenth sign, is increased only by one minute during the whole month. Above him, when on the meridian, are the two first stars of the Goat, to the west; and his slow approach towards these two stars may be noticed. The Moon passes him on the 14th.

Herschell is an evening star, being on the meridian at twenty-four minutes past five in the afternoon of the 1st, and every day later. His motion is direct, through little more than fifty minutes, in the fourth degree of the ninth sign, his latitude being about five minutes north the whole month. He is found therefore under the twenty-third of the Scorpion, but to the west of that star. The Moon passes him on the 9th.

The Sun's apparent diameter on the 2d is thirty-one minutes forty-six seconds, and on the 20th thirty-one minutes fifty-five seconds. The Moon's apparent diameter on the 2d, at midnight, is thirty-three minutes twenty-six seconds; and it decreases to the 16th, when it is twenty-nine minutes and a half. It then increases to the end of the month, finishing with the magnitude of thirty-three minutes eight seconds.

For the appearances of the fixed stars consult the description of their positions in the volume for 1806, according to the following table.

TABLE OF POSITIONS.

Pos.	1		8		16		25	
	h.	m.	h.	m.	h.	m.	h.	m.
VII.	6	46	6	21	5	52		
VIII.	8	51	8	26	7	57	7	28
IX.	10	54	10	29	10	0	9	31
X.	0	49	0	24	11	55	11	26
XI.	2	50	2	25	1	56	1	27
XII.	4	56	4	31	4	2	3	33
I.	6	46	6	21	5	52	5	23

OCTOBER, 1815.

I HAVE placed before you a probable case, in a planetary system; and so great is the variety of nature, that, if it does not exist in ours, it may in others. This is the case of two or more planets altering their relative characters, that which was superior becoming inferior, and vice versa. The view of our system, before the late discovery of the four planets, did not suggest to us such conjectures; nor am I as yet qualified to say, that it does or does not take place with respect to Ceres and Pallas. I wait for fuller observations, and more accurate calculations; and when the orbit of Pallas is completely ascertained, as I hope to present it to you hereafter, our question will be decided. The orbit of Ceres has not been touched hitherto by either of the two great observatories at Greenwich and Paris; and, perhaps, they wait till they can lay down satisfactorily the orbits of all the four planets. It cannot be doubted, that, by their labours, we shall soon be enabled to form a better judgement of the four bodies; but the difficulties attending the undertaking are such, that we must not be so impatient, as some of the German astronomers appear to have been upon this subject.

One thing will have occurred to you, in contemplating this extraordinary case; namely, that two planets so situated as to alter their relations to each other, by becoming at one time superior and at another inferior, may impinge one upon the other: and thus the system may receive an injury, which cannot be expected in the works of the divine architect. This will happen, indeed, when the distance of the two planets is the same in the node, at the time of conjunction; and supposing, as before, that the one is at its greatest, and the other at its least distance from the Sun, then, if the sum of the eccentricities is equal to the difference of the mean distances, an impact will happen. One will be moving at its greatest, the other at its least velocity; and, consequently, a shock would take place, occasioning convulsions far greater than any hitherto known to have been felt upon this Earth.

But why may not such an event occur? and, if it does, why should an imputation be thrown upon the divine architect! Our Earth, from whatever cause it arose, has received a convulsion, which was equally destructive to its inhabitants: and it recovered from the ruin spread over it probably to a greater degree of excellence, than it had before: Such a desolation would not, we may be sure, occur without justifiable reasons: and it is not for us to set limits to the wisdom of the Almighty. The wicked race upon this Earth had warning of their fate for a hundred and twenty years, before the mighty deluge of waters swept them away from the surface, which they had defiled by their iniquities. Yet preparation was made for the safety of the holy ones, from whom we are descended; and in like manner, if necessary, the Almighty hand would be stretched forth, in other worlds, to preserve his works.

What countless ages, however, would roll on, before the planets could be in such a situation, supposing them to have been launched forth from a point near to it! The planet with the greatest velocity would gradually recede from the other, and must pass it in numberless conjunctions, before one should take place, in which they would both be in their nodes with equal distances. The computation of such an event would be too laborious, as the best mathematician may soon discover, by taking the distance of the two planets as we have laid down for Ceres and Pallas, the inclination of their orbits to be thirty degrees, and the motion of their nodes a minute in a hundred years. The eccentricity would be taken of course agreeably to the nature of the problem.

But the distance of time, that might elapse, however consolatory to inhabitants living at a remote period from such an event, gradually diminishes, and, slow as are its approaches, it comes at last; and what then must be the sensation of the inhabitants expecting in a few years the impending destruction! Cannot we answer it from what we see around us, and experience in ourselves? What is the situation of mortal man? We must all appear before the judgement seat of Christ. The time is short to each of us; and no one can be prepared for the great day, but he who duly considers what he ought to be, and what becomes the Christian character. Such a one will say, I will not fear, though the Earth be moved, and its mountains are cast into the depths of the sea. My heart is fixed, looking stedfastly unto him in whom I place the whole confidence of my salvation.

With this impression on our minds, we will quit the subject, for the present, and proceed to the examination of the heavens for the present month.

New Moon commences at fifty-five minutes past ten on the night of the 2d; and on that day, at noon, her northern latitude is five degrees, in the third degree of the seventh sign. From that time she declines towards the ecliptick, passing her descending node on the 8th, about five in the afternoon, its place being in the twenty-eighth degree of the ninth sign. Her crescent is seen in the west-south-west in the evening of the 5th, under the second of the Balance, directing her course above the second of the Scorpion, as we shall perceive on the evening of the 6th, though she will have passed that star before her appearance. On the 7th, she is seen in the Milky-way, west of the seventeenth of the Serpent-bearer; and on the 8th, to have passed into the eastern branch of the Milky-way, directing her course under the twelfth of the Archer, which she will pass about midnight.

On the 8th, the Moon takes a southern direction, steering under the head of the Archer to her point of greatest latitude on the 15th, when it is at midnight five degrees two minutes, in the twenty-sixth degree of the twelfth sign. On the 9th, she is on the meridian at forty-nine minutes past five in the evening, the two thirteenths of the Archer being near to and above her, and the two first stars of the Goat and Saturn at some distance from her to the east. On the 10th, she is on the meridian at forty minutes past six, being now midway nearly between the small stars in the head of the Archer and the two first of the Goat, the former below her to the west, the latter above her to the east, having Saturn below them to the east. On the 11th, she is on the meridian at twenty-nine minutes past seven, being almost directly under Saturn, whom she 'will pass within two hours. Above her, to the west, are the two first stars of the Goat. On the 12th, she is on the meridian at sixteen minutes past eight, and every night later by about forty-three minutes. The small stars in the tail of the Goat are now near to and to the east of her. Saturn and the two first of this constellation at some distance to the west. On the 13th, when on the meridian, she has directly above her the four stars in triangle of the Water-urn; on the 14th, almost directly above her, the two western of the four stars in Square; and on the 15th, the four stars in Square, the two western on the west, and the two eastern on the east side of the meridian.

On the 16th, the Moon declines from her greatest latitude south, towards the ecliptick, passing on the 23d, about three in the morning, her ascending node, placed in the twenty-seventh degree of the third sign. Mars lies near her course, as we shall perceive during the night of the 16th; and on the 17th, she makes such rapid approaches towards him, that she will evidently pass him about Sun-rise.

On the 18th is full Moon, at three minutes past eight in the morning, with too great latitude to admit of an eclipse. In the evening, she rises under the three first stars of the Ram, to the west of the small stars in the head of the Whale, as she passes the first sixteenth at a little before midnight to the north of it, at the distance of only eight minutes. Mars is now to the west of her. On the 19th, she rises under the three first stars of the Ram, but to the east of them, being now on the eastern side of the head of the Whale above the eleventh star. On the 20th, she rises under the Pleiades, but will not reach the Hyades before Sun-rise. On the 21st, she rises nearly with the fifth of the Bull, this star being near to her, but to the west, as she passed it about two in the afternoon: they are followed by Aldebaran, and her recess from this star and the Hyades is the chief feature of her course, which is directed to the tenth of this constellation. On the 22d, she rises under the second of the Bull, or tip of the northern horn, and is soon followed by the sixth, or tip of the southern horn, between which she will soon pass, but nearest to the latter star, directing her course above the seventh and twelfth of the Twins. On the 23d, she rises with and near to the seventh and twelfth of the Twins, as she passed them about noon, her northern latitude giving her the advantage in rising, which her greater longitude would otherwise have taken away. She is very soon followed by the fifth, under which star she passes before midnight; and, during the morning of the 24th, we may observe her rapidly advancing from this star. Her northern latitude, beginning on the 23d, increases to the 29th, when it becomes at noon five degrees six minutes, in the twenty-seventh degree of the sixth sign. Her course, therefore, lies through nearly the middle of the Crab and the Lion.

On the 25th, the Moon rises under the two first stars of the Twins, and almost in a line with them, as will be seen during the morning of the 25th, by her passing this line. On the 26th, she rises in the morning under but near to the two small stars and nebula of the Crab. On the 27th, she rises under the small stars in the head of the Lion, and is soon followed by the seventh, which she does not pass till after Sun-rise. She will evidently pass between this star and the first of the Lion, but much nearest to the seventh. On the 28th, she rises under the first of the Lion, which star, from her rapid motion, is at some distance from her. On the 29th, she rises to the west of the head of the Virgin, but very near to the thirteenth, as she passes this star about six in the morning, to the north of it, and at the distance of half a degree. Above her, therefore, we shall notice the second of the Lion. In the afternoon she takes a southern direction to her descending node, which she passes on the 4th of next month, about nine at night, its place being in the twenty-fifth degree of the ninth sign.

Mercury is at his greatest elongation on the 20th, and an evening star during the whole month. His latitude is south the whole time, at first a degree, in the twenty-seventh degree of the seventh sign; and it increases to three degrees, in the twenty-fifth degree of the eighth sign. He sets too soon after the Sun to afford us a good opportunity of viewing him. The Moon passes him on the 4th.

Venus is in her inferior conjunction on the 13th, and consequently too near the Sun during the greater part of the month to be visible. After the 13th, she becomes a morning star; and, from her favourable position, will soon emerge from the Sun's rays. Her motion is retrograde, through fifteen degrees, having at first a latitude of eight degrees south in the twenty-sixth degree of the seventh sign, which decreases to about three degrees and twenty minutes. On the 25th, she is about twelve degrees above the horizon at Sun-rise; and this height is daily increasing. She rises under the five stars in triangle of the Virgin. The Moon passes her on the 30th.

Mars is on the meridian at midnight on the 17th, and will, during the whole month, present himself favourably to our observations. On the 17th, he is in opposition to the Sun, rising therefore, when the Sun sets. His motion is retrograde, through nine degrees; and on the 1st his latitude is three degrees twenty-six minutes south, in the twenty-ninth degree of the first sign; and this decreases to a degree and a half. At first, when he is on the meridian, he is under the three first stars of the Ram; and he directs his course to the twelfth of the Fishes, which he passes on the 27th, between three and four in the morning, at the distance of sixty-six minutes, being to the north of it. The Moon passes him on the 18th.

Ceres is a morning star, of sufficient height to be discovered before Sun-rise, and this height is daily increasing. Her motion is direct, through thirteen degrees and a half; and her latitude, at first seven degrees thirty-two minutes north, in the twelfth degree of the sixth sign, increases to eight degrees twenty minutes. She is first seen under the eighth of the Lion, to the west of a small star called *n*, which she passes in the afternoon of the 3d, being eighteen minutes from and to the south of it. She is directing her course at some distance, under the second of the Lion, to the face of the Virgin, to the fifteenth of this constellation, near to which she will pass.

Jupiter is in his conjunction on the 14th, and too near the Sun to be noticed till the end of the month, when some early risers will discover him a little before Sun-rise, near the horizon, in south-east by east. His motion is direct, through six degrees and three quarters; and his latitude, at first one degree six minutes north, diminishes only a minute.

Saturn is upon the meridian at five minutes past eight at night on the 1st, and at seven on the 19th. He is stationary on the 9th, being then in the sixth degree of the eleventh sign; and he just enters the seventh degree at the close of the month, the latitude remaining the whole time near fifty-one minutes south. He rises, therefore, under the two first stars of the Goat, and will be seen very nearly in the same position, with respect to them, during the whole month. The Moon passes him on the 10th.

Herschell is an evening star, being on the meridian at forty minutes past three in the afternoon of the 1st, and every day earlier. His motion is direct, through a degree and a half, from a point near the end of the fourth degree of the ninth sign, and his latitude, five minutes north, remains nearly the same the whole month. He is to be found, therefore, under the twenty-third of the Scorpion, moving towards the twenty-fourth. The Moon passes him on the 6th.

The apparent diameter of the Sun, on the 1st, is thirty-two minutes two seconds, and on the 19th thirty-two minutes twelve seconds. The apparent diameter of the Moon on the 1st, at noon, is thirty-one minutes ten seconds; and it decreases to the 13th, when it is twenty-nine minutes thirty-two seconds. It then increases to the 29th, when it becomes thirty-two minutes forty seconds, decreasing to the end of the month, and ending with a magnitude of thirty-two minutes sixteen seconds.

For the appearance of the fixed stars, see the description of their positions in the volume for 1806, according to the following table.

TABLE OF POSITIONS.

Pos.	1		8		16		25	
	h.	m.	h.	m.	h.	m.	h.	m.
VIII.	7	3	6	38	6	8	5	34
IX.	9	6	8	41	8	11	7	37
X.	11	1	10	36	10	6	9	32
XI.	1	2	0	37	0	7	11	33
XII.	3	8	2	43	2	13	1	39
I.	4	58	4	33	4	3	3	29
II.					6	6	5	32

NOVEMBER, 1815.

IN this month a phœnomenon of great importance to the knowledge of our system will be observed in various parts of the Earth; and, according to the accuracy of the observations and skill in the calculations made from them, another opportunity will be given of determining the distance of the Sun from us. This, you know, is a chief point; for, if that distance is accurately ascertained, and the position of Kepler is true, then we shall, by an easy proposition, be able to determine the distance of each of the planets from the Sun. Several things, however, go into the calculation, which prevent us from expecting to arrive at such a knowledge of the distance, as may be depended upon with mathematical accuracy; and, however true every part of the proposition on determining the distance of the Sun from the Earth by observations on the passage of an inferior planet over its disc, still the errors in the positions, on which the proposition is founded, will lead to very considerable allowances to be made in the conclusion. Hence I apprehend, that whatever distance is laid down of the Sun from the Earth at any time, it will be corrected by subsequent observations, and probably it will ever remain beyond the powers of man to determine this distance with precision. You may remember the pains that have been taken in this island to measure a distance of a few miles; and, if this could not be effected without very great difficulty, and of course the knowledge of a degree upon the Earth's surface cannot be complete, what must we expect, when not only distances on the Earth must be measured with accuracy, but times and angles must be settled with the utmost precision.

On the 12th of this month, Mercury passes over the Sun's disc. Unfortunately, it will be invisible in those parts, where are the best astronomers and best observatories: but still it will be visible in such an extent of country, that, if proper care is taken, sufficient information may be sent to Europe, on which the learned, in this part of the world, may ground their calculations. It would not be beneath the dignity of the East

India Company to give notice of this event throughout the vast peninsula over which it reigns; and to extend the information to the remotest corners of the east. Benares was famous formerly for its observatory; and India possesses Europeans of distinguished mathematical talents, on whom, we may be persuaded, this phœnomenon will not be lost. The governments of Europe patronised the travels of astronomers to observe the transits of Venus; and it will be an honour to the East India Company, if it should be the first to produce to the world an accurate account of the transit of Mercury, and the best calculations to which such an event naturally gives rise.

The circumstances to be attended to by observers in those regions, where the whole of the transit is perceivable, are, the precise moment of the appulse of the planet to the disc, and of its departure from it; the point of the disc where it enters and departs; the altitude of the Sun at that time; the times of its passing by equal parts of the line of transit; the height of the barometer and thermometer; and the height of their situation. Those persons, who can observe it only partially, will notice the positions, in which they observe it, and the precise time in which they make the observations, paying similar attention to the altitude of the Sun, the height of the barometer and thermometer, and the height of their situation. Thus, from the number of observers at different places, whose longitude and latitude are known, such data will be laid down, as may perhaps prevent very material errours.

To be prepared for this event, it is necessary first to know the time of the conjunction; and this is given by astronomers with different degrees of precision. The French tell us, that it will happen on the 11th, the English on the 11th, at fifteen hours past noon; and as you recollect, that astronomers count the time from noon to noon, you will perceive that both French and English agree in their astronomical day, the French, indeed, leaving the hour undetermined. This is, in vulgar time, at three o'clock in the morning of the 12th. A more complete account is given to us by Bode, who calculates, that the conjunction will be about forty-seven minutes nine seconds after three in the morning of the 12th, true time at Berlin. Hence, at the different parts of the Earth, astronomers will be prepared to observe the Sun's disc before the time at their residence, which answers to midnight of the 11th at Greenwich; and doubtless many, where the transit is completely visible, will watch the Sun from its rise.

From the calculation of Schubert, of Petersburg, who has calculated this transit for different places, its duration is four hours thirty-one minutes forty-three seconds; and Bode supposes, that the distances of Mercury and the Earth from the Sun are in the proportion of thirty-one thousand two hundred and seventy-eight to ninety-eight thousand nine hundred and fourteen. We shall learn by future calculations how far this agrees with the truth; and, if the time of the entrance and exit of the planet agree nearly with those laid down for them, this will be a good proof of the accuracy of our tables; if they differ materially, the cause of this difference will be investigated. As the problem is of such importance, ~~I shall give in the Appendix the posi~~tions of Mercury, as they are laid down by the astronomers of Berlin, Greenwich, and Paris: and it may be amusing to you to determine the time of the conjunction from each. The difference between the time at Paris and Greenwich is nine minutes and twenty-one seconds, between

Paris and Berlin forty-four minutes eight seconds.

It will amuse those, who have a globe of the Earth, to note those countries, where the transit will be visible in whole or in part; and this is done by finding the countries where the Sun is visible from about our twelve at night of the 11th, to six in the morning of the 12th; and it will be seen how large a tract of the Earth must evidently have a sight of the whole transit. In this space, we shall find the north-eastern parts of Asia, Kamtschatka, Siberia, Japan, China; East Indies, on the other side of the Ganges, all the Asiatick isles, New Zealand, New Holland, and great part of the Pacifick. In the north-west coast of America, California, Mexico, and the Straits of Magellan, and part of the Pacifick, the Sun sets during the transit: and in the west and southern part of Asia, the Indian Ocean, the east of Africa, and south-east of Europe, the Sun rises during the transit. As Botany Bay is in the part, where the whole transit is visible, due reports of every circumstance belonging to it will, without doubt, be made to our government: and, in fact, the English dominion is now so extensive, that the inhabitants of every region have a claim upon us for the fullest information, that can be given relative to the heavens, whether we take the term in its natural or spiritual sense. But I hasten to the consideration of those appearances in the heavens, which will be presented to us in this country.

New Moon on the 1st, at thirty-four minutes past nine in the morning; her latitude is at noon three degrees forty-one minutes north, in the tenth degree of the eighth sign. Of course her latitude is too great to admit of an eclipse. This decreases to the 4th, when she passes her descending node, in the twenty-fifth degree of the ninth sign, about nine at night. Her crescent is seen on the 3d, soon after Sun-set, near the horizon in the south-west; the unfavourableness of her position, notwithstanding her northern latitude, gives her this depression. She is above Antares, who sets too soon after Sun-set to be visible; and on the next evening we see her between the eighth of the Serpent-bearer and the twelfth of the Archer.

From the 4th her southern latitude commences, and it increases to the 12th, being at noon of that day five degrees ten minutes, in the twenty-eighth degree of the eleventh sign. In her course the chief object of remark is Saturn, who is at first considerably to the east of her, and she will evidently pass under him. On the 5th, we see her between the thirteenth and the small stars in the head of the archer, but nearest to the former star. On the 6th the small stars appear to the west of her. She is on the meridian at thirty-four minutes past four in the afternoon, when the two first stars of the Goat with Saturn below them, form a conspicuous figure to the east of her. On the 7th, she is on the meridian at twenty-four minutes past five, the two first stars of the Goat being almost directly above her, and Saturn so near to her to the east, that she will evidently pass under him before Sun-rise. Her approach to him and recess from the two first stars of the Goat is the chief feature in her course. On the 8th, she is on the meridian at thirteen minutes past six, the two first stars of the Goat and Saturn being to the west of her, and the small stars in the tail of the Goat to the east of her, but she will not reach them before Moon-set. On the 9th, she is on the meridian at fifty-eight minutes past six, being under but at a considerable distance from the second of the Water-bearer, and her course is now very slow, till she reaches her greatest southern latitude, passing the dreary region under the four stars in Square; and passing the line through the two eastern of them a little before she reaches this latitude. On the 12th, she is on the meridian at six minutes past nine, when these stars are almost directly above her, and Mars, under whom she will pass, is to the east of her. Her southern latitude is now decreasing, and she bends her course to her ascending node, which she passes on the 19th, about seven in the morning, it being placed in the twenty-sixth degree of the third sign. Her course therefore lies near to but above the Hyades and the sixth of the Bull.

On the 13th, the Moon is on the meridian at forty-eight minutes past nine, Mars being above and near to her, as she will evidently pass him before she sets; but, from her great southern latitude, between four and five degrees under him. On the 14th, she is on the meridian at thirty-one minutes past ten, the three first stars of the Ram being directly above her, and Mars now to the west of her. On the 15th, she is on the meridian at seventeen minutes past eleven, being now between the first of the Ram and the first of the Whale, but nearest to the latter star, the former being above her to the west, the latter below her to the east.

On the 16th is full Moon, at eight minutes past eleven at night; but, from her great latitude, without an eclipse: she rises under the three first stars of the Ram, which are at a considerable distance above her to the west. On the 17th, she rises under the Pleiades, followed soon by the Hyades, as she passes the fifth of the Bull about three quarters past ten at night, at the distance of fifty-three minutes, and to the north of that star. Aldebaran will therefore be seen near to and below her during the night. On the 18th, she rises nearly with, but at a considerable distance from Aldebaran, under the second of the Bull, and she passes between the tips of the horns at midnight, but near to the southern. On the 19th she is followed very soon after her rising by the seventh and twelfth of the Twins, which she soon passes, and directs her course under the fifth. She is now travelling from her node in a northern direction, and arrives at her greatest latitude on the 25th; and at noon it is five degrees fourteen minutes in the twenty-third degree of the sixth sign.

On the 20th, the Moon is followed soon after her rising by the fourth, as she passes the line between this star and the first of the Twins, near to the former star. On the 21st, she rises under the two first stars of the Twins, but to the east of the line drawn through them. On the 22d, she is seen under the small stars and nebula of the Crab, traversing the barren space between the Crab and the Lion; and on the 23d, she rises under the seventh of the Lion, being very soon followed by the first; and during the morning of the 24th, will be seen rapidly receding from these stars. On the 25th she rises in the morning, and bends her course in the afternoon to her descending node, which she passes on the 2d of next month between five and six in the morning. It is placed in the twenty-sixth degree of the ninth sign. She rises nearly with the second of the Lion, and is directing her course to the thirteenth of the Virgin, or small star in the head of that constellation, but does not reach it before Sun-rise. The first with Venus and Jupiter will form a beautiful groupe before that time to the east of her. On the 26th, she rises in the space contained by the five stars in triangle of the Virgin, steering her course through the third and fourth of this constellation. On the 27th, she rises under the five stars in Triangle, and is soon followed by the first of the Virgin and Venus; but her great northern latitude keeps her at a considerable distance from them, Jupiter soon adds to the beauty of the groupe. On the 28th, she rises under Venus, the first of the Virgin, and Jupiter; and on the 30th is new Moon, at fifty-one minutes past ten at night, with too great a latitude to admit of an eclipse.

Mercury is in his inferior conjunction on the 12th, to be seen in some parts of the world as a spot on the Sun's disc; after this he becomes a morning star; and at the latter end of the month will be detected in the south-east by some early risers. He is at his greatest elongation on the 28th, being then near to and above the thirteenth of the Balance. The Moon passes him on the 29th, at six in the morning, at the distance only of twenty-one minutes.

Venus is a morning star, and her height above the horizon at Sun-rise is every day increasing. Her motion is direct, through nearly twelve degrees; and on the 1st her latitude is three degrees seventeen minutes south, in the twelfth degree of the seventh sign; and this decreases, as she bends her course to her ascending node, which she passes on the 17th, in the fifteenth degree of the seventh sign, and then her northern latitude increases to a degree and three quarters. She rises at first under the five stars in triangle of the Virgin, nearly at equal distances from the third and first of this constellation. On the 14th she passes near the twenty-third of the Virgin, and thence directs her course by the first, passing this star, owing to her northern latitude, at some distance. At the latter part of the month we shall notice her approaches to Jupiter, to the east of her. The Moon passes her on the 27th.

Mars is on the meridian at forty-eight minutes past ten at night of the 1st, and at nine on the 26th. His motion is retrograde to the 17th, when he is stationary, in the eighteenth degree of the first sign; and his latitude, at first one degree thirty-four minutes south, in the twentieth degree of the same sign, decreases to six minutes south. He is found, therefore, nearly in the same place during the whole month, approaching to or receding from the sixth of the Fishes, from which star he will be distant only sixteen minutes on the 19th, the star being to the north. We see him soon after Sun-set in the middle region in the east, and, during the long nights, must have frequent opportunities of contemplating his fiery orb. The Moon passes him on the 14th.

Ceres is a morning star, at a considerable height above the horizon at Sun-rise. Her motion is direct, through twelve degrees; and her latitude, eight degrees twenty-three minutes north, in the twenty-fifth degree of the sixth sign, increases nearly nine degrees and a half. She is first seen in the head of the Virgin, and we have a good direction to her on the 2d, as she passes on that day the fifteenth of this constellation, at the distance of only seven minutes: she is directing her course towards the fourth of the Virgin, which she does not, however, reach this month; and she passes it to the north, thus daily wandering farther from the ecliptick limits. Several curious observers will discover her at first by the naked eye under the second of the Lion, as you remember the small stars in the head of the Virgin are under this star.

Jupiter is a morning star, at first too near the Sun to be visible. But we afterwards see him between the first of the Virgin and the tenth and eleventh of this constellation. His motion is direct, through six degrees; and his latitude, at first sixty-five minutes north, in the twenty-fifth degree of the seventh sign, is increased by a minute. The Moon passes him on the 28th.

Saturn is on the meridian at ten minutes past six at night on the 1st, and two minutes past five on the 19th. His motion is direct, through a degree and three quarters; and his latitude, at first fifty-one minutes south, in the seventh degree of the eleventh sign, continues nearly the same the whole month. We observe him receding slowly from the two first stars in the Goat, which, when he is on the meridian, are above him to the west, the small stars in the tail being at some distance from him to the east. The Moon passes him on the 8th.

Herschell is in conjunction with the Sun on the 30th, and too near the horizon to be seen at the first part of the month. His motion is direct, through a degree and three quarters; and his latitude, five minutes north, in the sixth degree of the ninth sign, continues nearly the same during the whole month.

The apparent diameter of the Sun on the 8th is thirty-two minutes twenty-two seconds, and on the 25th thirty-two minutes twenty-nine seconds. The apparent diameter of the Moon at noon of the 1st is thirty-two minutes eight seconds; and it decreases to the 9th, when it is twenty-nine minutes thirty-six seconds: it then increases to the 23d, when it is thirty-two minutes eighteen seconds; and it afterwards decreases, ending with a magnitude of thirty-one minutes seventeen seconds.

For the appearances of the fixed stars consult the volume for 1806, according to the following table of positions.

TABLE OF POSITIONS.

Pos.	1		8		16		24	
	h.	m.	h.	m.	h.	m.	h.	m.
VIII.	5	6	4	39	4	7		
IX.	7	9	6	42	6	10	5	36
X.	9	4	8	37	8	5	7	31
XI.	11	5	10	38	10	6	9	32
XII.	1	11	0	44	0	12	11	38
I.	3	1	2	34	2	2	1	28
II.	5	4	4	37	4	5	3	31
III.	6	53	6	26	5	54	5	20

DECEMBER, 1815.

YOU will have perceived, that in this year's volume the place of the nodes of the Moon is continually noticed, as also the place of the Moon at its greatest latitude. This was intended more particularly for the instructers in astronomy, that they may accustom their pupils to trace on the globe the course of the Moon for each month, which will be done with sufficient accuracy by taking a thread, and fixing it by wax on the place of the node, and then drawing it on the globe to the point of greatest latitude, and there fixing it in the same manner. The same will be done from the point of greatest latitude to the node, and it will be amusing to take threads of different colour for each monthly course, that the difference in the Moon's paths may be pointed out.

In thus pointing out the nodes so particularly to your notice, I could not but reflect on a circumstance, which belongs to all planets with Moons as well as our own, and which was, I believe, first suggested by Lichtenberg of Goettingen. This gentleman conceived, that a difference might take place in our atmosphere, and even in the weather, from the influence, that the particular position of the Moon might produce, when at the node. It has been a question, whether, in a total eclipse of the Sun, a similar influence might arise, but from a different cause: and indeed, when we consider that the pressure of the light on our atmosphere is taken away by the Moon from all those parts, that are completely darkened by it, whilst that pressure is acting upon the enlightened parts of the atmosphere, some change might be expected in the state of the air directly between us and the Moon. The time, however, that the air could be thus affected is so short, that, whatever change may take place, the result cannot be discovered but by very curious experiments.

The effect on the air, when the Moon is at the node, is supposed to be produced by a very different cause; and this takes place only, when the Moon is at the end of the first or beginning of the last quarter in the node, that is, when the longitude of the Moon is three signs or ninety degrees from the Sun. In this case the Earth and Moon pass nearly through the same part of space, and in a short time the one after the other. This time is some where between three and four hours, and it happens twice in this year; namely, the 1st of April and the 26th of September: in the first case, the Moon is followed by the Earth in space, and in the latter, the Earth precedes the Moon. The latitude of the Moon, in the first case, is fifteen minutes ten seconds south; and, in the second, seventeen minutes fifty-nine seconds. A considerable part, therefore, of the globe of the Earth, will pass through a part of the space occupied by the Moon, in the first instance; and, in the same manner, the Moon will pass through a considerable part of the space, before occupied by the Earth.

To those, who imagine, that the two globes of the Earth and Moon are moving in an empty void in the heavens, any conjecture on an effect to be produced by this circumstance will appear superfluous. The Moon revolves round the Earth, and the Earth moves on with its atmosphere, having nothing in the way to impede their course. But they, who look upon this no-tion of an empty void as a vain conceit, will be prepared to expect some change to take place in air, from the difference that must be produced in the medium, through which it passes. The Moon, in preceding the Earth, must have removed of this medium a quantity equal to her bulk; and the Earth, in following her, must find that medium in a different situation, from what it would have been, supposing the Moon had been two hundred thousand miles from its path. The air, therefore, being susceptible of variation from every change in the pressure upon it, may naturally be expected to be affected in some degree from the peculiarity of this situation.

Supposing the reasoning to be just on this occasion, and that an effect is really produced on the air, still it must be very difficult to make this perceptible to our senses. For, if the height of the mercury in the barometer was affected by it, still we cannot expect the variation to be great; and it would be least, in those climates, where the changes, that take place from accidental causes, are so frequent, and perhaps it may be so small, as to elude the researches of the philosopher in the more favoured regions of the Earth. The conjecture, however, has been thought worthy of notice by one of the best astronomers, that Europe produces; and therefore, whatever treatment it may receive in England, and however I may doubt with him on the real effect produced by this situation of the Moon and Earth, I cannot but think it worthy of attention. It will give the philosopher little trouble to note the state of the air at these times, which always occur, when the latitude of the Moon at the end of the first or beginning of the last quarter is less than her horizontal parallax. The effect, of course, will be greatest, when at these times the Moon is actually in the plane of the ecliptick; but such a case rarely occurs: if the effect is observable in this case, something corresponding to it will be discovered when the situations are not so advantageous. I leave you to turn the case over in your own mind, and proceed to the occurrences in the heavens during this month.

The Moon's latitude becomes south on the 2d, and increases to the 9th, when it is at noon five degrees sixteen minutes and three quarters, in the twenty-fourth degree of the twelfth sign. She then bends her course upwards again to the ecliptick, which she passes in her ascending node between two and three in the afternoon of the 16th, in the twenty-fourth degree of the third sign. She now travels northwards, and her latitude becomes greatest on the morning of the 23d, being at midnight of the 22d five degrees seventeen minutes, in the twenty-seventh degree of the sixth sign; and bending to the ecliptick, she passes it in her descending node on the 29th, in the twenty-fifth degree of the ninth sign. Her crescent sets near the south-west on the 2d, and she is seen before that time near to and under the twelfth of the Archer. On the 3d, she is seen near the small ones in the head of this constellation. On the 4th she is under the two first stars of the Goat and Saturn.

On the 5th the Moon is on the meridian within a minute of four in the afternoon, the two first stars of the Goat being above her to the west, and Saturn near to her to the east, but she does not pass him till after Moon-set. On the 6th, she is on the meridian at three quarters past four, being just to the east of the small stars in the tail of the Goat, the fourth being almost directly above her. Saturn is now to the west of her. On the 7th, she is on the meridian at twenty-nine minutes past five, having above her at some distance the first of the Water-bearer to the west, and the four small stars in triangle of the Urn to the east, but very near to it. On the 8th, she is on the meridian at eleven minutes past six, being almost directly under the two western of the four stars in Square. Mars, on the other side of the two eastern of these stars, is at a considerable distance from her. On the 9th, she is on the meridian at fifty-two minutes past six, having above her the four stars in Square, the two eastern being near to it on the east. Mars is above her at a considerable distance between her and the three first stars of the Ram. On the 10th, she is on the meridian at thirty-three minutes past seven, Mars being above her to the east, but so near that she will evidently be passing him at her next appearance. On the 11th, she is on the meridian at fourteen minutes past eight, Mars being now above her to the west of but near to it. Her motion for the last four days has been very slow. On the 12th, she is on the meridian at fifty-seven minutes past eight, being near the small stars in the head of the Whale. On the 13th she is on the meridian at forty-four minutes past nine, having these small stars now to the west of her. On the 14th she is on the meridian at thirty-four minutes past ten, the Pleiades being above her to the west, and the Hyades nearer to her to the east. On the 15th she is on the meridian at twenty-nine minutes past eleven, the Hyades being considerably to the west of her, as she passed the fifth of the Bull in the morning about eight, to the north of it, and at the distance of fifty-two minutes.

On the 16th is full Moon, at fifty-eight minutes past noon; and as the latitude of this Moon is only about five minutes, an eclipse takes place, to be perceived, not by us, but by our antipodes. She rises soon after Sun-set, under the second of the Bull, or tip of the northern horn. She is directing her course above the seventh and twelfth of the Twins, as she passes the former of these stars about two hours after midnight, at the distance of eighty-seven minutes, and to the north of it. On the 17th, she rises under the fifth of the Twins. On the 18th, under the two first, and in a line nearly with them. On the 19th under the two small stars and nebula of the Crab, and is seen during a long night to be traversing the barren space between the Crab and the Lion. On the 20th she rises nearly in a line with the seventh and third of the Lion, passing the line between the seventh and the first before midnight, but nearest to the former star. On the 21st, she is seen traversing the body of the Lion, and directing her course to the small stars in the head of the Virgin. On the 22d, she rises under the small stars in the head of the Virgin; and, during the morning of the 23d, is seen in the space contained by the five stars in triangle of that constellation, directing her course to Jupiter and Venus, to the east of her.

On the 24th the Moon rises in the morning, under the five stars in triangle of the Virgin, having passed through the space between the third and fourth. On the 25th she rises nearly with the first of the Virgin, and is soon followed by Jupiter, the former to the west the latter to the east of her; and, as the morning advances, Venus adds her lustre to the lower region in the south-east. On the 26th, the Moon rises under and not far from Jupiter, and is followed by the two first stars of the Balance and Venus, by which she will have passed before her next appearance. On the 27th she rises under the two first stars of the Balance and Venus, directing her course to the second of the Scorpion; and on the 30th is new Moon, at fifty-one minutes past two in the afternoon, by which an eclipse is produced to some parts of the Earth, though it is invisible in this country.

Mercury is a morning star during the whole month, but visible only during the former part of it. He is at first upwards of an hour and three quarters above the horizon before Sun-rise, and this time is daily decreasing. He rises first under the two first stars of the Balance between the thirteenths and sixths of this constellation, and directs his course to the second of the Scorpion, which he passes on the 10th, near midnight, at the distance of only eight minutes, Mercury being to the north. We may see him, therefore, to sufficient advantage when that star is in the south-east on the next morning, about forty minutes before Sun-rise. On the 16th he passes Herschell at the distance of twenty-five minutes, and to the north of this planet, but he is so near the horizon at Sun-rise, that very few will detect him before it in the south-east. The Moon passes him on the 29th.

Venus is a morning star, having on the 24th the appearance of a half Moon, and her apparent diameter is twenty-three seconds. Her motion is direct, through nearly twenty-nine degrees. Her latitude, at first one degree fifty-four minutes north, in the twenty-fourth degree of the seventh sign, increases to nearly three degrees and a quarter. She rises at first nearly with the first of the Virgin to the west of her, passing at night the star called *m*, in this constellation, at the distance of only ten minutes, and to the north of it. She directs her course to the tenth, passing this star on the 10th at night, at the distance of twenty minutes, but to the south of it. She now directs her course through the space between the two first stars of the Balance, any passes the twelfth of this constellation about two in the morning of the 21st, at the distance of fifty-eight minutes, and to the north of it. On the 28th, about an hour after Sun-set, she passes the first fifteenth of the Balance at the distance of twenty-one minutes to the north of it, and on the 30th the first sixth of the Balance, about Sun-set, at the distance of sixty-six minutes, and to the north of it. During this course we shall notice her passage by Jupiter, which, on the 11th, will give great splendour to the lower region of the eastern hemisphere towards south-east, but she goes to the north of him at the distance of more than a degree and a half. The Moon passes her on the 26th.

Mars is on the meridian at forty minutes past eight at night on the 1st, and at thirty-seven minutes past seven on the 19th. His motion is direct, through nine degrees; and his latitude, at first five minutes north, in the nineteenth degree of the first sign, increases to nearly a degree. His progress lies through the barren space between the band of the Fishes and the Ram, and in it he passes on the 18th a small star called 53, at the distance of fifty-three minutes, and to the south of it. The sixteenth is to the east of him, and this star he passes on the 21st, about eleven at night, the star being sixty-seven minutes from and to the north of him. When he is on the meridian at the end of the month, the two small of the three first stars of the Ram, are directly above him. The Moon passes him on the 11th.

Ceres is a morning star, affording very good opportunities for noticing her path, for she is on the meridian on the 23d at eight in the morning, and every following morning earlier. Her motion is direct, through ten degrees and three quarters; and her latitude, at first nine degrees twenty-nine minutes north, in the seventh degree of the seventh sign, increases to eleven degrees. She directs her course to the fourth of the Virgin, which star she passes on the 7th, in the evening, at the distance of sixty-four minutes, the star being to the south of her. She is now pursuing her course out of the usual planetary track; and many telescopes will be directed towards her, to follow the steps of the wanderer.

Jupiter is a morning star. His motion is direct, through five degrees and three quarters; and his latitude, at first sixty-seven minutes north, in the first degree of the eighth sign, increases to seventy minutes. He rises at first at twenty minutes past four in the morning, and every day earlier. We see him at first under the tenth of the Virgin, and he directs his course to the eleventh, which star he passes on the 22d, about midnight, at the distance of thirty-eight minutes, the star being to the south of him. Under these two stars he will therefore rise for the remainder of the month; and he directs his course to the first of the Balance. We have already noticed the interesting passage of Venus by him. The Moon passes him on the 25th.

Saturn is on the meridian at fourteen minutes past four in the afternoon of the 1st, and every day later; and the duration of his stay above the horizon after Sun-set diminishes very rapidly. His motion is direct, through two degrees and three quarters; and his latitude, at first fifty minutes south, in the eighth degree of the eleventh sign, is increased by one minute. The two first stars of the Archer are seen above him to the west, when he is on the meridian, and his path is marked by no distinguished objects. On the 9th, he passes a small star called 19 of the Archer, about four in the afternoon, to the south of it, at the distance of twenty-three minutes; and on the 23d the small star 21 at about eleven at night to the south of it, at the distance of twenty minutes. The Moon passes him on the 5th.

Herschell has passed his conjunction so very lately, that he will not be visible during the former part of the month. At the latter part he is a morning star, about nine degrees above the horizon at Sun-rise, near south-east by south. His motion is direct, through two degrees and a quarter; and his latitude, at first four minutes north, in the eighth degree of the ninth sign, continues nearly the same the whole month. He is moving slowly from the twenty-fourth of the Scorpion, advancing by the end of the month to the middle point between that star and the western branch of the Milky-way. The Moon passes him on the 28th.

The apparent diameter of the Sun on the 4th is thirty-two minutes and a half, and on the 14th thirty-two minutes thirty-four seconds. The Moon's apparent diameter on the 1st at noon is thirty-one minutes two seconds; and it decreases to the 7th, when it is at midnight twenty-nine minutes thirty-four seconds. It then increases, becoming on the 19th thirty-two minutes thirty-eight seconds; and it then decreases to the end of the month, finishing with a magnitude at midnight of half a degree.

For the appearances of the fixed stars consult the account of their positions in the volume for 1806, according to the following table.

TABLE OF POSITIONS.

Pos.	1		8		17		25	
	h.	m.	h.	m.	h.	m.	h.	m.
IX.	5	6	4	36	3	56	3	20
X.	7	1	6	31	5	51	5	15
XI.	9	2	8	32	7	52	7	16
XII.	11	8	10	38	9	58	9	22
I.	0	58	0	28	11	48	11	12
II.	3	1	2	31	1	51	1	15
III.	4	50	4	20	3	40	3	4
IV.	7	11	6	41	6	1	5	25
V.			8	32	7	52	7	16

The observations on this year are thus brought to a conclusion; and I cannot, at the close of them, but congratulate my reader on the satisfaction, that must take place in every mind on the late changes in the political world, by which, among other advantages, our science is likely to receive considerable improvement. Great Britain is no longer dissevered from the rest of Europe, and the spirit of the accursed Cain seems likely to give way to pacifick dispositions. Peace, delightful sound! is restored to this part of the Earth, and communications will be more frequent and certain between those, whose business it is to improve, not to destroy mankind. In various parts are enlightened men, occupied with observations on the heavens, and there is a greater desire than ever to assist each other by their mutual endeavours. It shall be my task to collect from all quarters; and I think that I have proved, in this year's volume, that, however desirable the information may be, that is to be obtained from our own royal observatory, still it is by no means necessary, as has been supposed and wantonly insinuated, to the existence of this work. Various are the sources of my information; and I trust that they will be increased, not diminished. I hope, indeed, that both France and England will be alive to the demands that are made upon them; and that they will vie with

Ceres, P the mean distance and e the eccentricity of Pallas. Then, to make Pallas a superior planet in the node, the distance of Pallas must be greater than that of Ceres; *i.e.* $P + e$ must be greater than $C - E$, or $e + E$ must be greater than $C - P$, or the sum of the eccentricities must be greater than the difference of the mean distances.

But it is not necessary, that we should look to the nodes only. The conjunction of the planets will take place in other parts of the orbit, and then of course that planet, whose distance at that time is the greatest, will be the *superior planet.* Supposing the conjunction to take place at the nodes, when Ceres is in its aphelion and Pallas in its perihelion, and the motion of these points to be very slow, then Ceres will be a superior planet, and maintain its superiority for myriads upon myriads of years. A time will, however, come, when it may lose this superiority; and we shall be able to determine this case when the mean distances and eccentricities of these planets are accurately ascertained. Nothing of this kind can of course occur with respect to the other two planets, as their distances from each other and the two superior planets are much too great, to admit of those extraordinary changes.

Table of the Geocentrick Longitude and Latitude of the Planet Ceres.

JANUARY.

Day.	Longitude.			Latitude.	
	Sign.				
1	2	15°	32′	1°	8′ N.
9	2	14	13	1	31
17	2	13	22	1	55
25	2	12	56	2	19

FEBRUARY.

	Sign.				
1	2	12°	55′	2°	41′ N.
9	2	13	[illegible]	2	57
17	2	14	9	3	12
25	2	15	19	3	25

MARCH.

	Sign.				
1	2	16°	1′	3°	32′ N.
9	2	17	43	3	44
17	2	19	39	3	55
25	2	21	50	4	5

APRIL.

	Sign.				
1	2	23°	38′	4°	16′ N.
9	2	26	31	4	26
17	2	29	15	4	34
25	3	2	5	4	41

MAY.

Day.	Longitude.			Latitude.	
	Sign.				
1	3	4°	25′	4°	48′ N.
9	3	7	30	4	38
17	3	10	40	5	2
25	3	13	54	5	10

JUNE.

	Sign.				
1	3	16°	48′	5°	19′ N.
9	3	20	12	5	26
17	3	23	39	5	33
25	3	27	8	5	40

JULY.

	Sign.				
1	3	29°	54′	5°	48′ N.
9	4	3	21	5	54
17	4	6	54	6	1
25	4	10	32	6	9

AUGUST.

	Sign.				
1	4	13°	39′	6°	16′ N.
9	4	17	18	6	23
17	4	20	57	6	31
25	4	24	35	6	41

SEPTEMBER.

Day.	Longitude.			Latitude.	
	Sign.				
1	4	27°	46′	6°	51′ N.
9	5	1	25	7	1
17	5	5	2	7	11
25	5	8	30	7	22

OCTOBER.

	Sign.				
1	5	11°	21′	7°	32′ N.
9	5	14	56	7	44
17	5	18	27	7	57
25	5	21	54	8	10

NOVEMBER.

	Sign.				
1	5	24°	50′	8°	23′ N.
9	5	28	10	8	39
17	6	1	25	8	56
25	6	4	35	9	13

DECEMBER.

	Sign.				
1	6	6°	30′	9°	29′ N.
9	6	9	46	9	40
17	6	12	31	10	11
25	6	15	7	10	35

Geocentrick Longitude and Latitude of Mercury on certain Days in November, 1815, *as determined for the Observatories of*

BERLIN.

Days.	Longitude.			Latitude.	
	Sign.				
7	7	24°	33′	1°	22′ S.
10	7	21	4	0	24
13	7	17	4	0	37 N.
16	7	13	40	1	30

GREENWICH.

	Sign.				
7	7	24°	31′	1°	21′ S.
10	7	21	2	0	24
13	7	17	3	0	37 N.
16	7	13	40	1	31

PARIS.

	Sign				
7	7	24°	31′	1°	21′ S.
10	7	21	4	0	44
13	7	17	11	0	35 N.
16	7	13	41	1	30

The difference between the French and the other accounts on the 10th in latitude, and on the 13th in longitude, require particular attention. The accuracy of the calculations will be determined by the transit.

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Poppin's Court, Fleet Street.